13th Quadrennial iCACGP Symposium
13th IGAC Science Conference
on Atmospheric Chemistry

BRAZIL NATAL 2014
22-26 September

Changing Chemistry in a Changing World

iCACGP

INTERNATIONAL GLOBAL
IGAC
ATMOSPHERIC CHEMISTRY

SCIENTIFIC PROGRAM
2014

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Scientific Program
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WELCOME MESSAGE TO THE PARTICIPANTS OF THE 13TH QUADRENNIAL SYMPOSIUM OF THE INTERNATIONAL COMMISSION ON ATMOSPHERIC CHEMISTRY AND GLOBAL POLLUTION, iCACGP

Organized jointly with the 13th Science Conference of the International Global Atmospheric Chemistry Project, IGAC.

Natal, Brazil 22-26th September 2014

The International Commission on Atmospheric Chemistry and Global Pollution, iCACGP, warmly welcomes all the participants to its 13th Quadrennial Symposium, iCACGP-QS, which is being undertaken jointly with the 13th Science Conference of the International Global Atmospheric Chemistry Project, IGAC-SC. This scientific symposium and conference provides an evolving and unique forum for discussion and exchange between researchers. It facilitates the dissemination of the latest knowledge, derived from research in the fields of atmospheric chemistry, global air pollution and their feedback with climate change.

This meeting also celebrates the 25th anniversary of the inauguration of the Global Atmosphere Watch, GAW, and programme of the World Meteorological Organisation WMO. The key mission of the GAW partnership for our research is to provide scientific data, which are well calibrated and validated. In particular the results achieved within GAW provide unique insight into the changing chemical composition of the atmosphere, and facilitate the assessment of its natural and anthropogenic origins, thereby improving our understanding of interactions between the atmosphere, the oceans and the biosphere. GAW is also one of the sponsors of this meeting. We also take this opportunity to thank all the sponsors of the meeting, which are to be found on the meeting website http://www.igac-icacgp2014.org/.

This is the first time that either the iCACGP Quadrennial Symposium, ICACGP-QS, or the IGAC Science Conference, IGAC-SC, has been hosted in South America. We extend our thanks to the South American Local Organisation Committee, LOC, led by Professor Judith J. Hoelzemann from the Universidade Federal do Rio Grande do Norte (UFRN) in Natal without whose efforts this unique meeting would not be taking place. Similarly we thank the joint Scientific Program Committee led by its coordinators, Professor Russell Dickerson of the University of Maryland, and Professor Yinon Rudich of the Weizmann Institute, and the session convenors for choosing our distinguished keynote and invited speakers and for their selecting such an outstanding and exciting set of scientific presentations.

The Commission on Atmospheric Chemistry and Radioactivity, CACR, was created during the International Geophysics Year in 1957 with its name being changed to the Commission on Atmospheric Chemistry and Global Pollution, CACGP and then in 2006 to iCACGP. The international organisation and co-ordination of the atmospheric and relevant earth sciences are facilitated by iCACGP, which reports to the International Association of Meteorology and Atmospheric Sciences, IAMAS. Eight Associations, addressing the different physical science research fields within the Earth Sciences including IAMAS, constituent the International Union of Geodesy and Geophysics, IUGG. The International Council for Science founded in 1931 as the International Council for Scientific Unions and known as ICSU comprises 30 scientific unions one of which is IUGG.

The earth system is entering the next phase of the Anthropocene, where population is predicted to rise from the current value of over 7 billion to 10 billion in 2080s, whilst at the same time the percentage of people dwelling in urban areas is projected to increase from 50 to 75%. Our research identifying and understanding the processes determining the past, present and future behaviour of the system, comprising the sun, the earth's surface and its atmosphere is of crucial importance. The evidence thus obtained about the anthropogenic modification of the earth system will in the next decades become of even greater societal significance, as policymakers face the challenge of achieving sustainable development.

To meet the need for improved global understanding of key aspects of the earth system, identified in the first period of rapid post economic growth in the 20th century, the International Geosphere Biosphere Programmes was launched by ICSU to coordinate international research on global-scale and regional-scale interactions between the Earth's biological, chemical and physical processes and their interactions with human systems. In 1988 members of iCACGP initiated the International Global Atmospheric Chemistry Project, which became one of the first core Projects of IGBP. iCACGP now scientifically sponsors IGAC together with IGBP and the Surface Ocean Lower Atmosphere Study, SOLAS, together with IGBP, the Scientific Committee on Oceanic Research (SCOR) and the World Climate Research Programme (WCRP). Recently ICSU has launched Future Earth, which is a new 10-year international research initiative that will develop the knowledge for responding effectively to the risks and opportunities of global environmental change and for supporting transformation towards global sustainability in the coming decades. This comprises part of and works with key elements of the ICSU Earth System Science Partnership (ESSP), which includes IGBP, the World climate Research Programme, WCRP, Diversitas, and the international Human Dimensions Programme, IHDP.

During the week of the Joint Symposium in Natal, we hope that you all are fascinated by the innovative researches presented. Similarly the novel and emerging research directions stimulated by the exchanges between outstanding scientists in the field and the young researchers will be an important outcome.

These new ideas will drive our efforts to overcome the scientific challenges of the years ahead and meet our mission to deliver i) an improved understanding of the fundamental mechanisms that control and determine atmospheric composition; ii) improved predictive capabilities, focusing on the needs to protect the environment and iii) the provision of knowledge needed for solving societal issues, which address water supply, food production and human/ecosystem health. More information about iCACGP can be obtained at our web site http://www.icacgp.org.

The ICACGP Officers 2010-2014:

Professor John P. Burrows
(President)

Professor Laura Gallardo
(Vice President)

Dr. Frank Dentener
(Secretary)

The iCACGP membership 2010-2014: Professor Maria de Fatima Andrade, Brazil ; Professor Russell R. Dickerson USA ; Professor James R. Drummond Canada ; Professor David P. Edwards USA; Professor Sara Feresu, Zimbabwe; Professor David Fowler UK; Professor Laurens Ganzeveld, The Netherlands ; Dr. Christian George, France; Dr. Roland von Glasow, UK ; Professor Sergey Gromov Russia; Professor Sachiko Hayashida, Japan; Professor Maria Kanakidou, Greece; Dr. Melita Keywood, Australia; Professor Yutaka Kondo, Japan; Professor Nilgun Kubilay, Turkey; Professor Shaw Liu, Taiwan ; Professor Paul Monks UK ; Dr. Manish Naja, India; Professor Kobus J. J. Pienaar, South Africa ; Professor Nicole Riemer, USA ; Dr. Andreas Stohl, Norway ; Professor Barbara Turpin USA; Professor Douglas Wallace (2010-2014) Germany/Canada ; Professor Jason West USA ; Professor Renyi Zhang USA ; Professor Yuanhang Zhang China.

WELCOME LETTER FROM IGAC SSC

Coordinating and fostering
atmospheric chemistry research
towards a sustainable world

igacproject.org

On behalf of the IGAC community, we would like to like to welcome you to the 13th Biennial IGAC / 13th Quadrennial ICACGP Symposium in Natal, Brazil. IGAC is very grateful to the Local Organizing Committee and the Scientific Program Committee for organizing this very exciting conference.

IGAC was established in 1990 to address international concern over rapid changes observed in the earth's atmosphere. Over the last 20+ years IGAC has played a key role in underpinning the scientific understanding of atmospheric composition and the processes that drive change in the Earth's atmosphere. IGAC's mission is as important today as it was when it was founded.

The theme of this year's conference is "Changing Chemistry in a Changing world". The world is changing in many different ways, through large shifts in environmental, economic and societal spheres. As this global change occurs on all levels the atmosphere becomes a key indicator, as well as a key conduit of that change. There is a pressing need to understand how the atmosphere is and will continue to change, and how that change will impact global sustainability.

IGAC is responding to this challenge with its mission *to coordinate and foster atmospheric chemistry research towards a sustainable world* by integrating, synthesising, guiding and adding value to research undertaken by individual scientists, through initiating new activities, acting as a hub of communication for the international atmospheric research community and through building scientific capacity. The challenge of change and the way we must frame our science in the future is important. We need to take account of the need to provide the healthy roots to the "atmospheric chemistry tree" in terms of our fundamental science but at the trunk and branch level to think about the connections of our science in the changing world and the role of sustainability.

Although the IGAC community comes together every two years for our biennial conference, IGAC activities are ongoing. Please visit http://www.igac.project.org to learn more about current IGAC activities and how you can be involved in the IGAC community. Throughout the week we encourage you to speak with members Scientific Steering Committee to learn more about IGAC and its activities, we look forward to sharing an exciting week of discussions on atmospheric chemistry in the changing world with you.

Sincerely,

Prof. Paul Monks
Co-Chair
Department of Chemistry
University of Leicester, UK
P.S.Monks@leicester.ac.uk

Dr. Allen Goldstein
Co-Chair
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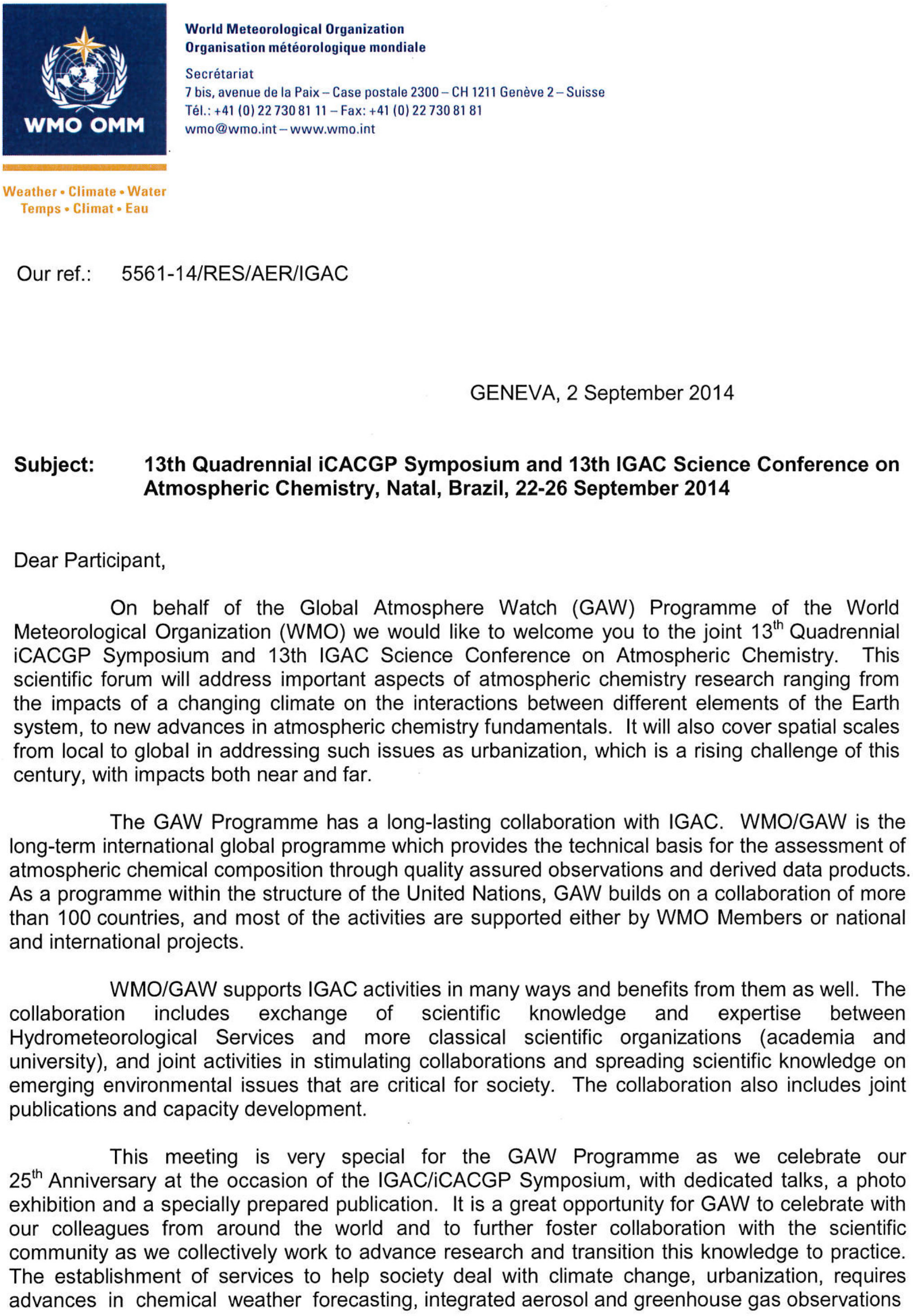
IGAC SSC Members:
Jonathan Abbatt, University of Toronto, Canada
Mary Barth, NCAR, USA
Claire Grainer, LATMOS-IPSL, France
Colette Heald, MIT, USA
Judith Hoelzemann, UFRN, Brazil
Melita Keywood, CSIRO, Australia
Mark Lawrence, IASS, Germany
Candice Lung, Academia Sinica, Taiwan
Olga Mayol-Bracero, University of Puerto Rico, Puerto Rico
Spyros Pandis, University of Patras, Greece
Rokjin Park, Seoul National University, South Korea
Yinon Rudich, Weizmann Institute, Israel
Chhemendra Sharma, National Physical Laboratory, India
Hiroshi Tanimoto, NIES, Japan
Tao Wang, Hong Kong Polytechnic University, Hong Kong
Noureddine Yassaa, CDER, Algeria



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

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Our ref.: 5561-14/RES/AER/IGAC

GENEVA, 2 September 2014

Subject: 13th Quadrennial iCACGP Symposium and 13th IGAC Science Conference on Atmospheric Chemistry, Natal, Brazil, 22-26 September 2014

Dear Participant,

On behalf of the Global Atmosphere Watch (GAW) Programme of the World Meteorological Organization (WMO) we would like to welcome you to the joint 13th Quadrennial iCACGP Symposium and 13th IGAC Science Conference on Atmospheric Chemistry. This scientific forum will address important aspects of atmospheric chemistry research ranging from the impacts of a changing climate on the interactions between different elements of the Earth system, to new advances in atmospheric chemistry fundamentals. It will also cover spatial scales from local to global in addressing such issues as urbanization, which is a rising challenge of this century, with impacts both near and far.

The GAW Programme has a long-lasting collaboration with IGAC. WMO/GAW is the long-term international global programme which provides the technical basis for the assessment of atmospheric chemical composition through quality assured observations and derived data products. As a programme within the structure of the United Nations, GAW builds on a collaboration of more than 100 countries, and most of the activities are supported either by WMO Members or national and international projects.

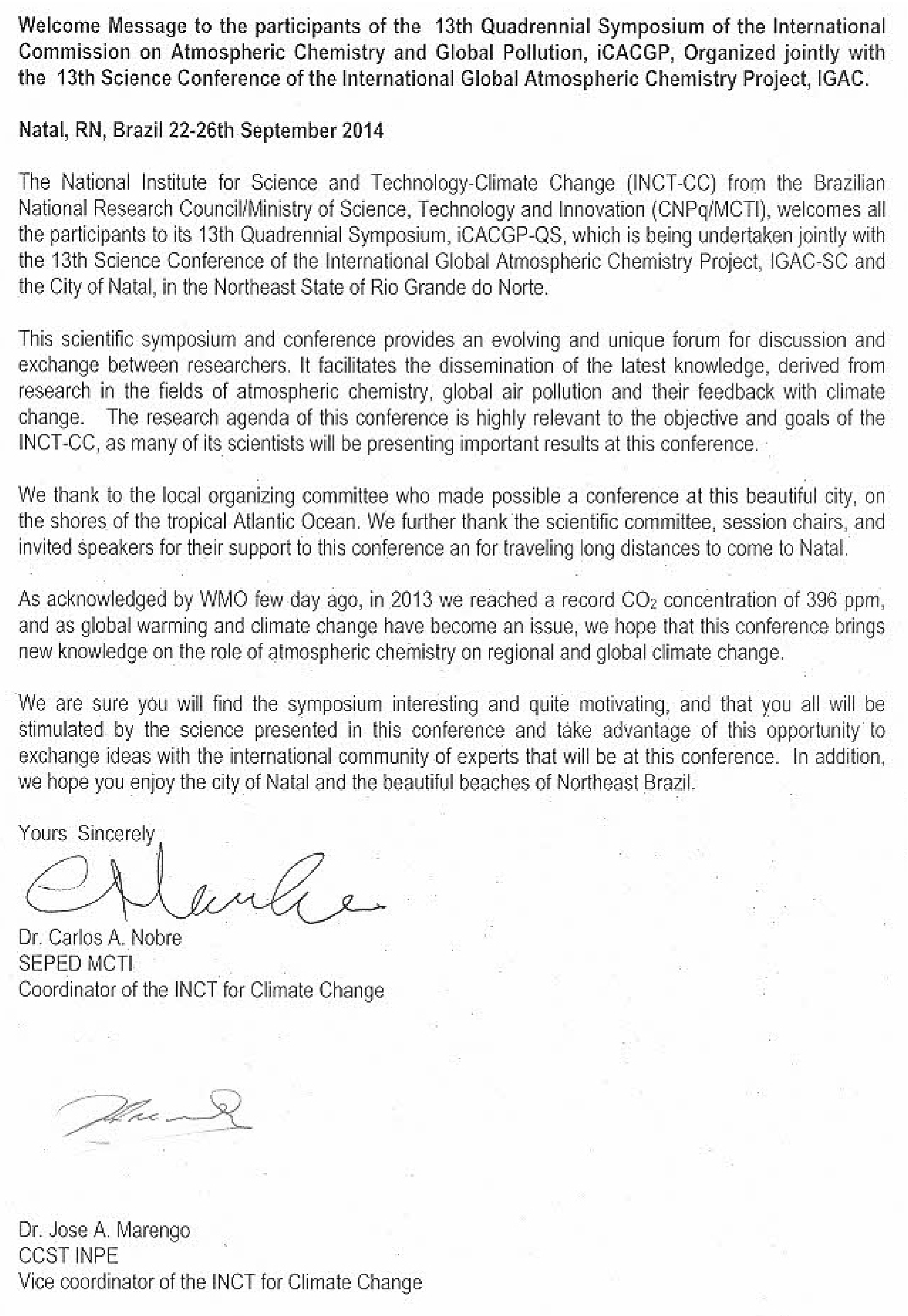
WMO/GAW supports IGAC activities in many ways and benefits from them as well. The collaboration includes exchange of scientific knowledge and expertise between Hydrometeorological Services and more classical scientific organizations (academia and university), and joint activities in stimulating collaborations and spreading scientific knowledge on emerging environmental issues that are critical for society. The collaboration also includes joint publications and capacity development.

This meeting is very special for the GAW Programme as we celebrate our 25th Anniversary at the occasion of the IGAC/iCACGP Symposium, with dedicated talks, a photo exhibition and a specially prepared publication. It is a great opportunity for GAW to celebrate with our colleagues from around the world and to further foster collaboration with the scientific community as we collectively work to advance research and transition this knowledge to practice. The establishment of services to help society deal with climate change, urbanization, requires advances in chemical weather forecasting, integrated aerosol and greenhouse gas observations and analysis systems, among others. These services need the strong contributions from the cross-cutting multi-disciplinary research that is concentrated in IGAC. We hope that the discussions during the meeting will be beneficial for all involved communities and that it will bring many scientifically interesting initiatives that are also useful for society.

Yours sincerely,

Dr O. Tarasova
Chief
Atmospheric Environment Research Division
Research Department
World Meteorological Organization

Prof. Greg Carmichael
Chair
Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee (EPAC-SSC)



Welcome Message to the participants of the 13th Quadrennial Symposium of the International Commission on Atmospheric Chemistry and Global Pollution, iCACGP, Organized jointly with the 13th Science Conference of the International Global Atmospheric Chemistry Project, IGAC.

Natal, RN, Brazil 22-26th September 2014

The National Institute for Science and Technology-Climate Change (INCT-CC) from the Brazilian National Research Council/Ministry of Science, Technology and Innovation (CNPq/MCTI), welcomes all the participants to its 13th Quadrennial Symposium, iCACGP-QS, which is being undertaken jointly with the 13th Science Conference of the International Global Atmospheric Chemistry Project, IGAC-SC and the City of Natal, in the Northeast State of Rio Grande do Norte.

This scientific symposium and conference provides an evolving and unique forum for discussion and exchange between researchers. It facilitates the dissemination of the latest knowledge, derived from research in the fields of atmospheric chemistry, global air pollution and their feedback with climate change. The research agenda of this conference is highly relevant to the objective and goals of the INCT-CC, as many of its scientists will be presenting important results at this conference.

We thank to the local organizing committee who made possible a conference at this beautiful city, on the shores of the tropical Atlantic Ocean. We further thank the scientific committee, session chairs, and invited speakers for their support to this conference an for traveling long distances to come to Natal.

As acknowledged by WMO few day ago, in 2013 we reached a record CO_2 concentration of 396 ppm, and as global warming and climate change have become an issue, we hope that this conference brings new knowledge on the role of atmospheric chemistry on regional and global climate change.

We are sure you will find the symposium interesting and quite motivating, and that you all will be stimulated by the science presented in this conference and take advantage of this opportunity to exchange ideas with the international community of experts that will be at this conference. In addition, we hope you enjoy the city of Natal and the beautiful beaches of Northeast Brazil.

Yours Sincerely

Dr. Carlos A. Nobre
SEPED MCTI
Coordinator of the INCT for Climate Change

Dr. Jose A. Marengo
CCST INPE
Vice coordinator of the INCT for Climate Change

WELCOME LETTER FROM THE ICACGP/IGAC-2014 LOCAL ORGANIZING COMMITTEE

On behalf of the Local Organizing Committee we welcome you to the joint 13th IGAC Science Conference and 13th Quadrennial iCACGP Symposium that are being hosted for the first time in its history in South America.

The theme of the 13th iCACGP/IGAC-2014 Conference, “Changing Chemistry in a Changing World”, addresses the critical interactions between the atmosphere and human activities that keep changing with our changing world. In an era where humans have fundamentally altered the composition and chemistry of our atmosphere, mainly through historical emissions of those now developed countries, it is fundamental to understand the role of emerging economies. This theme fits quite well the host country, Brazil, particularly for this being the first iCACGP or IGAC symposium/conference ever to be held in Latin America. Brazil has experienced fast social and economic development in the last two decades with strong pressure on local environment, particularly, but not only, on the Amazon region. Despite efforts to control deforestation, Brazil has been not so effective in reducing biomass burning emissions or on keeping our energy matrix clean. With atmospheric chemistry experts from around the world attending the conference, we will have the opportunity to extensively discuss many questions related to atmospheric chemistry in a changing world, the influence of Megacities, interactions with climate, impacts on human health, surface-atmosphere exchange, and the fundamentals of our science.

iCACGP/IGAC quadrennial symposia/biannual conferences are traditionally among the primary mechanisms for dissemination of scientific information across the atmospheric chemistry community. Our conference will feature five days of plenary sessions, with invited keynote and submitted oral presentations, coupled with innovative and high quality poster sessions. The latter are the key integrating aspect. Posters will be displayed continuously throughout the meeting.

The Young Scientist Program is another strong and traditional feature. We will have around 70 supported Young Scientists at our conference and a number of YS extra activities were organized to foster communication among YS and also exchange with Senior Scientists who are attending. Finally, this joint 13th Quadrennial iCACGP Symposium / 13th IGAC Science Conference also celebrates the 25th Anniversary of the World Meteorological Organization’s (WMO) Global Atmosphere Watch (GAW) addressing the issues of both operational and academic research.

We welcome you all to iCACGP/IGAC-2014 in Natal, Brazil and hope you have a fantastic time during the conference and also enjoy the city and surroundings of Natal. Local staff and the LOC will be available with any support you may need.

Sincerely,

Your Local Organizing Committee:

Judith Hoelzemann

Prof. Judith Hoelzemann
(LOC Chair)
UFRN / CCET/ PPGCC
Federal University of
Rio Grande do Norte
Natal/RN, Brazil

Prof. Adriana Gioda
PUC-Rio
Pontificial Catholic University of
Rio de Janeiro
Rio de Janeiro/RJ, Brazil

Eliane Ignotti

Prof. Eliane Ignotti
UNEMAT
State University of Mato Grosso
Cáceres/MT, Brazil

Henrique de Melo Jorge Barbosa

Prof. Henrique Barbosa
USP / IF
University of São Paulo
São Paulo/SP, Brazil

Prof. Ricardo Godoi
UFPR
Federal University of Paraná
Curitiba/PR, Brazil

Rodrigo Augusto F. de Souza

Prof. Rodrigo Souza
UEA
State University of Amazonas
Manaus/AM, Brazil

WELCOME FROM THE SCIENTIFIC PROGRAM COMMITTEE

A warm welcome from your Scientific Program Committee on behalf of the international Commission on Atmospheric Chemistry and Global Pollution (iCACGP) and the International Global Atmospheric Chemistry (IGAC) Project. **“Changing Chemistry in a Changing World”**, a joint conference representing the 13th Quadrennial iCACGP Symposium, and the 13th IGAC Science Conference on Atmospheric Chemistry, promises to explore a wide range of exciting topics inspired by the proximity to the tropical Atlantic Ocean, new megacities, and the world’s largest rainforest with unparalleled biodiversity. Themes range from coupling between biogenic and anthropogenic emissions to interactions among aerosols, clouds and precipitation. As our understanding of atmospheric chemistry grows, so too grows the need to cross traditional boundaries of media and discipline. The only constant is change, the interactions such as chemistry and climate offer not only intellectual stimulation but opportunity to help shape policy based on sound science.

We give great thanks to the local organizing committee who made possible a conference at this beautiful venue. We further thank the scientific committee, session chairs, and invited speakers for doing the heavy lifting. We want to thank Megan Melamed for doing a great job behind the scene!

We trust you will find the symposium enlightening and motivating. As the Earth’s population grows and energy use inexorably expands, great challenges lie ahead of us. We hope you will be stimulated by the science presented in this conference and take advantage of this opportunity to exchange ideas with the broad international community of experts brought together in the spirit of scientific discovery for environmental benefit.

Yours Truly,

Yinon Rudich
(SPC Co-Chair,
Weizmann Institute, Israel)

Russell Dickerson
(SPC, Co-Chair,
University of Maryland, USA)

Scientific Program Committee members (alphabetic order)
Alex Guenther (NCAR, Boulder, USA)
Barbara Turpin (iCACGP, Rutgers University, USA)
Christian George (iCACGP, CNRS, Univ. Claude Bernard, Lyon, France)
Colette Heald (IGAC, MIT, Boston, Massachusetts, USA)
Jonathan Abbatt (IGAC, University of Toronto, ON, Canada)
Judith Hoelzemann (LOC, University of Rio Grande do Norte, Natal, Brazil)
Laura Gallardo (Center for Climate and Resilience Research, Santiago, Chile)
Maria Kanakidou (iCACGP, University of Crete, Greece)
Megan Melamed (IGAC Officer, University of Colorado, Boulder, USA)
Olga Mayol-Bracero (IGAC, University of Puerto Rico)
Rokjin Park (IGAC, Seoul National University, South Korea)
Roland von Glasow (iCACGP, University of East Anglia, UK)
Spyros Pandis (IGAC, Univ. of Patras, Greece & Carnegie Mellon Univ. Pittsburgh, USA)
Tao Wang (IGAC, Hong Kong Polytechnic University, China)

DETAILED PROGRAM

Time	General Program		Young Scientists Program (YSP)	Location
	September 20 - Saturday			
12:00-16:00			YS informal get-together at the beach in front of the YS hotel, volley/soccer games	Vila do Mar Hotel
16:00-18:00	Registration			
18:00-22:00			YS Welcome Cocktail	
	September 21 - Sunday			
13:30-14:30	Registration			CCN
14:30-18:10			YS Mini-Workshop with lectures by Keynote/Invited Speakers of each session	
19:00-22:00			YS / Senior Scientist Mixer	Sal & Brasa Churrascaria
	September 22 - Monday			
8:00-8:30	Keynote: Paulo Artaxo	The close links between the biological functioning of amazonia and atmospheric chemistry		CCN
	Session 1: Atmosphere-surface (ocean/vegetation/ice) interactions in a changing climate Chairs: Alex Guenther, Roland von Glasow			
8:30-8:50	Invited S1 Thomas Karl	Probing the atmospheric oxidation capacity based on airborned eddt covariance measurements of volatile organic compounds		

8:50-9:05		S1.1 Christopher Wilson	In-situ and Satellite Observations in the Amazon Basin and Variational Inverse Modelling Indicate Increased Dry-Season Emissions of Methane	CCN
9:05-9:20		S1.2 Tania Tavares	Nitrous oxide release from agroproduction of biodiesel confirms global warming reduction by replacing fossil fuels in Northeast Brazil	
9:20-9:35		S1.3 Yinon Rudich	Fire and smoke in the Amazon Basin: a combined statistics	
9:35-9:50		S1.4 Ian Galbally	Observations of Atmospheric Acetonitrile in the Mid-Latitudes of the Southern Hemisphere and its Global Distribution Away from Biomass Burning Influences	
9:50-10:20		Coffee Break		
10:20-10:40		Invited S1 Lucy Carpenter	Progress in understanding the emissions, chemistry and impacts of reactive halogens	CCN
10:40-10:55	**YS**	S1.5 Katerina Sindelarova	Spatio-temporal variability of biogenic isoprene emissions and their impact on atmospheric chemical composition	
10:55-11:10		S1.6 Karine Sellegri	Marine Primary and Secondary Aerosol emissions related to seawater biogeochemistry from a mesocosm study	
11:10-11:25		S1.7 Hiroshi Tanimoto	In situ measurement of air-sea exchange of volatile organic compounds by PTR-MS coupled with gradient flux technique in the Pacific Ocean	
11:25-11:40	**YS**	S1.8 Raluca Ciuraru	Volatile organic compounds emission from light-induced reactions at the sea surface microlayer	
11:40-11:55		S1.9 Roland von Glasow	Reactive halogens in the polar boundary layer	
11:55-13:15		Lunch		

		Session 6: Atmospheric chemistry in a changing climate Chairs: Colette Heald, Rokjin Park		
13:15-13:35		Invited S6 Jason West	Connecting Climate Change, Air Pollution, and Human Health	CCN
13:35-13:50	**YS**	S6.1 Laura Baker	Climate responses to perturbations of short-lived climate forcers	
13:50-14:05		S6.2 Yuhang Wang	Wildfire and regional climate variability: A global perspective	
14:05-14:20		S6.3 William C. Porter	Examining the observed and modeled sensitivities of air-quality extremes to meteorological drivers using advanced statistical techniques	
14:20-14:40		S6.4 Susanne Bauer	Impact of agricultural emissions on future climates	
14:40-15:05		Coffee Break		
15:05-16:15		Opening Ceremony		
16:15-19:00		Icebreaker + Poster Session (S1 & S6)		

		September 23 - Tuesday		
8:00-8:20		Invited S6 Paul Young	Herding cats or herding sheep? A multi-model perspective on tropospheric ozone	CCN
8:20-8:35		S6.5 Ricardo Henrique Moreton Godoi	Integrated analysis of air pollution at Antarctic: an overview of the Brazilian Antarctic Monitoring and the Brazilian standalone module - Criosfera 1	
8:35-8:50	**YS**	S6.6 William Morgan	Transformation of aerosol chemical composition and resultant impact on climate during the South American Biomass Burning Analysis (SAMBBA)	
8:50-9:05		S6.7 Laura Gallardo	Connecting air qualilty and climate over and downwind Santiago de Chile	

9:05-9:20		S6.8 Russell Dickerson	The impact of climate on air quality - Studies from the eastern US		CCN
9:20-9:35		S6.9 Yukio Fukuyama	Operational aircraft observation of atmospheric CO2, CH4, CO and N2O in the mid-troposphere over the western North Pacific		
9:35-9:50	**YS**	S6.10 Anke Roiger	Quantifying emerging local anthropogenic emissions in the Arctic region: the ACCESS aircraft campaign experiment		
9:50-10:20			Coffee Break		
	Session 5: Atmospheric chemistry fundamentals Chairs: Jon Abbatt, Christian George				
10:20-10:40		Invited S5 Carl Percival	The role of Criegee Intermediates in Tropospheric Chemistry		CCN
10:40-10:55		S5.1 Thomas F. Mentel	A new class of low-volatility organic compounds in new particle formation		
10:55-11:10		S5.2 Thorsten Hoffmann	High molecular weight / low volatile organics in SOA: Homogeneous vs. heterogeneous formation		
11:10-11:25		S5.3 Anke Mutzel	A combined ELVOC study at the Leipzig aerosol chamber (LEAK) and at the TROPOS research station Melpitz		
11:25-11:40	**YS**	S5.4 Haofei Zhang	Comprehensive Speciation of Organic Aerosols Reveals Evaporation and Oxidation Kinetics of Long-Chain Normal Alkanes		
11:40-11:55	**YS**	S5.5 Liselotte Tinel	Imidazole-2-carboxaldehyde, a new efficient photosensitizer: fundamental kinetics and proposed mechanism for the formation of halide radicals.		
11:55-13:15			Lunch	YS Lunch with an Invited/Keynote Speaker	

13:15-13:35		Invited S5 Jason Surratt	Heterogeneous Chemistry of Isoprene-Derived Epoxides Leading to Secondary Organic Aerosol Formation	CCN
13:35-13:50		S5.6 Eleanor Browne	Impact of oxidative aging on the chemical composition and optical properties of brown carbon aerosols	
13:50-14:05	**YS**	S5.7 J. Michel Flores	Complex refractive indices in the near-ultraviolet spectral region for biogenic secondary organic aerosol aged with ammonia	
14:05-14:20		S5.8 Dwayne Heard	Heterogeneous uptake of HO2 radicals to aerosols. Mechanistic insights from laboratory measurements and kinetic modelling.	
14:20-14:45			Coffee Break	
14:45-15:15	**GAW**	Keynote: Greg Carmichael	Global Atmospheric Watch - Celebrating 25 Years!	CCN
15:15-18:00		GAW Celebration + Poster Session (S3 & S4)		

September 24 - Wednesday

8:00-8:30		Keynote: Jos Lelieveld	Strongly growing air pollution and related mortality, especially in Asia	CCN
	Session 3: Interactions between aerosols, clouds and precipitation Chairs: Spyros Pandis, Barbara Turpin			
8:30-8:50		Invited S3 Ilan Koren	Process level analysis of invigoration in warm convective clouds	
8:50-9:05		S3.1 Frida Bender	Aerosol effects on subtropical marine stratocumulus cloud albedo in climate models and satellite observations	
9:05-9:20		S3.2 Pablo Saide	Central American biomass burning smoke can increase tornado severity in the US	
9:20-9:35	**YS**	S3.3 Carlos J. Valle Díaz	Impact of Long-Range Transported African Dust Events on Cloud Chemistry at a Caribbean Tropical Montane Cloud Forest	
9:35-9:50		S3.4 Madeleine Sánchez Gácita	Hygroscopic behavior and CCN activity of biomass burning aerosols in Brazil: preliminary results	

9:50-10:20			Coffee Break	
10:20-10:40		Invited S3 Akua Asu-Awuka	The Chemical and Physical Evolution of Complex Cloud Condensation Nuclei	CCN
10:40-10:55	**YS**	S3.5 Kerri Pratt	Molecular Composition of Organic Compounds in Atmospheric Particles and Cloud Water during SOAS: Insights into Aqueous Processing	
10:55-11:10	**YS**	S3.6 Kristina Pistone	The effect of atmospheric properties and processes on aerosol indirect effects in a trade cumulus regime	
11:10-11:25	**YS**	S3.7 Benjamin N. Murphy	New particle formation in pristine Amazonian deep convective clouds	
11:25-12:15			Lunch (Pick up brown bag lunch)	
12:15-18:00		Tours		

September 25 - Thursday

Session 4: Atmospheric chemistry and urbanization: from local to the global scales

Chairs: Laura Gallardo, Tao Wang

8:00-8:20		I4.3 - Tong Zhu	Air pollution in China: Scientific and Public Policy Challenges	CCN
8:20-8:35		S4.1 Laura Dawidowski	Levels and composition of PM2.5 in the metropolitan area of Buenos Aires: local and regional contributions in inland versus coastal sites	
8:35-8:50		S4.2 Jiang Zhu	Assimilation of surface PM2.5 observations from more than 300 stations into an air quality model over China	
8:50-9:05		S4.3 Catherine Liousse	African anthropogenic combusion emissions: impact on atmotspheric compoistion and health in 2005 and 2030	
9:05-9:20	**YS**	S4.4 Aishwarya Raman	Using chemical ratios to disentangle sources of particulate matter pollution: Implications for population exposure and human mortality	
9:20-9:35		S4.5 Dara Salcedo	PM chemical characterization in Tijuana (México) during the Cal-Mex Campaign	

9:35- 9:50		S4.6 Márcia Akemi Yamasoe	Aerosol particles optical depth retrievals at Sao Paulo city and effect on downward solar irradiance at the surface		CCN
9:50- 10:05		S4.7 Tami Bond	Energy-related emission projections: the nexus of economy, infrastructure, and technology		
10:05- 10:35			Coffee Break		
10:35- 10:55		Invited S4 Michael Gauss	Modelling different spatial scales		CCN
10:55- 11:05	**GAW**	S4.8 Marcos Froilan Andrade Flores	Results from the first two years of aerosol and gas observations at the world”s highest GAW station: Chacaltaya, Bolivia		
11:05- 11:25		S4.9 Sachiko Hayashida	Tropospheric ozone climatology since 1995 over East Asia		
11:25- 11:40	**YS**	S4.10 Roelof Petrus Burger	In-situ characterization of air quality over South Africa		
11:40- 11:55		S4.11 Anne Mee Thompson	Is Tropospheric Ozone Really Increasing over Southern Africa? Evidence of a Paradox from Surface, Sonde and Aircraft Observations		
11:40- 11:55		S4.12 Spyros Pandis	Organic aerosol concentration and composition over Europe: Insights from chemical transport modeling and factor analysis data		
11:55- 13:15		Lunch			
13:15- 13:30		S4.13 Melita Keywood	Investigations of the formation and growth of ultrafine particles in a coastal urban environment		
13:30- 13:45		S4.14 John Burrows	Observing the Anthropocene from Space		
13:45- 14:05		Invited S4 Paulo Saldiva	Combining greenhouse gases emission mitigation and health co-benefits due to reduction of local air pollutants: a global perspective		
13:45- 17:00		Coffee Break + Posters (S2 & S5)		YS evaluation/ visioning meeting (afternoon)	

18:30-22:00	Banquet		YS poster awards ceremony during conference banquet (evening)	Vila Hall-Vila do Mar Hotel

September 26 - Friday

8:00-8:30	Keynote: A. R. Ravishankara	Why do we do the (atmospheric) science we do?	CCN
	Session 2: Atmospheric chemistry and the coupling between biogenic and anthropogenic emissions Chairs: Maria Kanakidou, Olga Mayol-Bracero		
8:30-8:50	Invited S2 Anne Marie Carlton	Atmosphere-biosphere interactions during SOAS through multiphase chemistry	
8:50-9:05	S2.1 Maria Cristina Facchini	Impact of emissions and climate stressors on the atmospheric aerosol composition during the 2012 PEGASOS field campaign	
9:05-9:20	S2.2 Hanwant B. Singh	Wildfire emissions and their interaction with urban and rural pollution: data and simulations	
9:20-9:35	S2.3 Alfred Wiedensohler	Measurements of black carbon particle mass concentration and particle number size distribution on a large high altitude city over the Andean mountains and its possible transport to the lower free troposphere	
9:35-9:50	S2.4 Casper Labuschagne	AEROSOL OPTICAL PROPERTIES AT CAPE POINT GAW STATION, SOUTH AFRICA: A CONFLUENCE OF MARINE AND CONTINENTAL ENVIRONMENTS	
9:50-10:05	S2.5 Akinori Ito	Organic nitrogen formation in the atmosphere and deposition to the ocean	
10:05-10:35	Coffee Break		

10:35-10:55		Invited S2 Steven S. Brown	Nocturnal biogenic VOC oxidation in the residual layer: Night flights in the Southeast U.S. during SENEX 2013		CCN
10:55-11:05	**YS**	S2.6 Lindsay Diana Yee	Observational Constraints on Terpene Oxidation with and without Anthropogenic Influence in the Amazon using Speciated Measurements from SV-TAG		
11:05-11:25		S2.7 Joel Ferreira Brito	Non-refractory submicron aerosol composition before and after Manaus as observed during GoAmazon2014/5		
11:25-11:40	**YS**	S2.8 Edward Malina	Mapping of biogenic and abiogenic methane from space using GOSAT and ACE		
11:40-11:55		S2.9 Yingjun Liu	Tracking anthropogenic influence on isoprene chemistry over Amazonia		
11:55-12:05		S2.10 Astrid Kiendler-Scharr	Night time formation of secondary organic aerosol: new evidence for a strong source from NO3 oxidation		
12:05-12:20		S2.11 Tibisay Pérez	The relative importance of water soluble organic nitrogen in tropical atmospheric deposition. Possible mechanisms and implications to regional tropical ecosystems atmospheric nitrogen sources.		
12:20-12:35		S2.12 Maria Kanakidou	Humans vs. Nature as Drivers of Tropospheric Gases and Aerosol Changed over the Last Decades		
12:35-14:00		Special Farewell Lunch			
14:00-15:00		Closing Ceremony		YS evaluation/visioning resume and YS Best Speakers Awards during closing ceremony.	CCN

POSTER PRESENTATIONS

SESSION 1: ATMOSPHERE-SURFACE (OCEAN/VEGETATION/ICE) INTERACTIONS IN A CHANGING CLIMATE

P1.1 **SUBMICROMETER MARINE SECONDARY ORGANIC AEROSOL AND MSA OVER THE NORTHERN AND SOUTHERN ATLANTIC OCEAN**
Alfred Wiedensohler

P1.2 **ASSOCIATION BETWEEN THE CONCENTRATION OF CARBON MONOXIDE AND MORTALITY RATE FOR ACUTE MYOCARDIAL INFARCTION THE POPULATION IN SÃO PAULO, BRAZIL.**
Ana Carla Dos Santos Gomes

P1.3 *YS* **BVOC PROFILES AT THE AMAZONIAN TALL TOWER OBSERVATORY SITE.**
Ana Maria Yañez-Serrano

P1.4 *YS* **THE ROLE OF FIRE EMISSION HEIGHTS IN THE CLIMATE SYSTEM: AN ECHAM6-HAM2 MODELLING STUDY**
Andreas Veira

P1.5 **HIGH-RESOLUTION VERTICAL PROFILES OF SPECIATED MONOTERPENES IN A CENTRAL AMAZONIAN TERRA FIRMA FOREST**
Angela Jardine

P1.6 *YS* **OVERVIEW OF EMISSIONS AND CHEMISTRY OF VOCS IN THE KATHMANDU VALLEY, NEPAL DURING THE SUSKAT-ABC FIELD CAMPAIGN DERIVED FROM THE FIRST PTR-TOFMS DEPLOYMENT IN SOUTH ASIA**
Chinmoy Sarkar

P1.7 **PHOTOSENSITIZED CHEMISTRY AT THE AIR/SEA INTERFACE: A SOURCE OF FUNCTIONALIZED VOC AND AEROSOLS**
Christian George

P1.8 *YS* **BIOMASS BURNING IN EAST ASIA AFFECTS ANHYDROSUGARS IN AEROSOLS AT OKINAWA IN THE WESTERN NORTH PACIFIC**
Chunmao Zhu

P1.9 *YS* **SESQUITERPENE EMISSION, CONCENTRATION AND REACTIVITY IN A BOREAL FOREST**
Ditte Mogensen

P1.10 *YS* **EMISSIONS OF TERPENOIDS, BENZENOIDS, AND OTHER BIOGENIC GAS-PHASE ORGANIC COMPOUNDS FROM AGRICULTURAL CROPS AND THEIR POTENTIAL IMPLICATIONS FOR AIR QUALITY**
Drew Roland Gentner

P1.11 **AIR POLLUTION DISPERSION BY MESOSCALE CIRCULATIONS OVER THE METROPOLITAN AREA OF SÃO PAULO**
Edmilson D. Freitas

P1.12 **INDIVIDUAL MARINE AEROSOL PARTICLES FROM THE HIGH ARCTIC INVESTIGATED BY SCANNING ELECTRON MICROSCOPY AND FOURIER TRANSFORM INFRARED NANOSPECTROSCOPY**
Evelyne Hamacher-Barth

P1.13 **NATURAL EMISSIONS IN THE BRAZILIAN AMAZON RAINFOREST: IMPACT ON THE OXIDATIVE CAPACITY OF THE ATMOSPHERE**
Fernando Cavalcante dos Santos

P1.14 *YS* **VOC-MEASUREMENTS AT RIVERSIDE-BASED TIWA HOTEL IN THE VICINITY OF MANAUS – AM (BRASIL)**
Florian Wurm

P1.15 **DISPERSION MODELING OF VOLCANIC ASH CLOUDS: THE PUYEHUE–CORDÓN CAULLE ERUPTION IN JUNE 2011, AND ITS IMPACT IN SOUTH BRAZIL**
Graciela Arbilla de Klachquin

P1.16 **CHEMICAL CHARACTERISTICS OF FOG/CLOUD WATER IN A SUBTROPICAL FOREST**
Guenter Engling

P1.17 *YS* **OZONE REACTIVITY MEASUREMENT FOR BIOGENIC VOLATILE ORGANIC COMPOUND (BVOC) EMISSIONS DURING THE SOUTHEAST OXIDANT AND AEROSOL STUDY (SOAS)**
Jeong-Hoo Park

P1.18 **VARIABILITY OF TROPOSPHERIC OZONE IN A POLLUTED MARINE ENVIRONMENT**
Joelle Buxmann

P1.19 *YS* **PHOSPHORUS SPECIATION IN ATMOSPHERIC DEPOSITION SAMPLES IN THE EASTERN MEDITERRANEAN: FLUXES, ORIGIN AND BIOGEOCHEMICAL IMPLICATIONS.**
Kalliopi Violaki

P1.20 *YS* **NUTRIENT CYCLING IN RAINFALL, THROUGHFALL AND STEMFLOW IN AN BRAZILIAN SEMIARID REGION**
Karinne Reis Deusdará Leal

P1.21 **CHANGES IN LAND USE AND EMISSIONS OF GREENHOUSE GASES IN THE SEMIARID NORTHEAST, PERNAMBUCO, BRAZIL**
Kelly Ribeiro

P1.22 **GENES ENCONDING CLIMATE CHANGE**
Kleydson Ramos de Sena

P1.23 **INTEGRATION OF C1, C2,3, AND C5 METABOLISM IN TREES**
Kolby Jardine

P1.25 **AEROSOL OPTICAL PROPERTIES, DOWNWARD SOLAR IRRADIANCE AND OZONE CONCENTRATIONS MEASURED AT HUMAITÁ, AM, DURING THE BIOMASS BURNING SEASON OF 2012**
Márcia Akemi Yamasoe

P1.26 **NEUROPOGON AURANTIACO-ATER AS BIOMONITOR OF AIR QUALITY OF FILDES PENINSULA, KING GEORGE ISLAND, ANTARCTIC PENINSULA**
María Margarita Préndez Bolívar

P1.27 *YS* **CHARACTERISING EMISSION RATIOS OF TRACE GASES FROM AUSTRALIAN BUSH FIRES**
Maximilien Desservettaz

P1.28 *YS* **DIRECT MEASUREMENTS OF AIR-SEA VOLATILE ORGANIC CARBON TRANSPORT**
Mingxi Yang

P1.29 **TRANSFORMATION OF ASIAN DUST PARTICLES OVER THE CENTRAL NORTH PACIFIC**
Mitsuo Uematsu

P1.30 *YS* **CHEMICAL COMPOSITION AND SOURCES OF ATMOSPHERIC AEROSOLS AT DJOUGOU (BENIN)**
Laura Dawidowski

P1.31 **BOTTOM-UP CONSTRAINTS ON REACTIVE NITROGEN EMISSIONS FROM BIOMASS BURNING**
Patricia Castellanos

P1.32 *GAW* **AN ASSESSMENT OF PRECIPITATION CHEMISTRY AT THE SOUTH AFRICAN DEBITS SITES**
Pieter Van Zyl

P1.33 *YS* **CLIMATE VARIABILITY AND CARDIOVASCULAR DISEASE MORTALITY IN ELDERLY IN THE MATO GROSSO CITIES**
Poliany Rodrigues

P1.34 **INFLUENCE OF GEOGRAPHICAL DISTRIBUTION OF VSL OCEANIC SOURCES AND THE STRENGTH OF CONVECTION ON THE TROPICAL BROMINE PARTITIONING**
Rafael Pedro Fernandez

P1.35 *YS* **AEROSOL MASS SPECTROMETRY OF NATURAL BIOGENIC AEROSOLS IN AMAZONIA**
Rafael Stern

P1.36 **PARTICLE FORMATION THROUGH PHOTOSENSITIZED REACTIONS AT THE AIR-SEA INTERFACE**
Raluca Ciuraru

P1.37 **OBSERVATIONS OF CHLORINE SPECIES IN THE UK**
Roberto Sommariva

P1.38 **MULTI-PHASE HALOGEN CHEMISTRY IN THE TROPICAL ATLANTIC OCEAN**
Roland von Glasow

P1.39 **MODEL EXAMINATION OF NEW ANTARCTIC SEA-ICE, DMS DERIVED, AEROSOL FORMATION MECHANISM FOR THE SOUTHERN OCEAN REGION**
Ruhi Humphries

P1.40 *YS* **IMPACTS OF LONG AND SHORT-TERM CLIMATE VARIABILITY ON TERRESTRIAL BIOGENIC EMISSIONS AND GLOBAL AND REGIONAL ATMOSPHERIC CHEMISTRY**
Sarah Monks

P1.41 *YS* **QUANTIFYING ISOPRENE AND MONOTERPENES IN THE REMOTE MARINE BOUNDARY LAYER**
Sina Corinna Hackenberg

P1.42 *YS* **TWO-PARAMETER APPROACH FOR ESTIMATING BIOMASS BURNING EMISSIONS OF NOX FOR THE AFRICAN CONTINENT**
Stefan F. Schreier

P1.43 **ATMOSPHERIC CHEMICAL SPECIATION OF REACTIVE NITROGEN COMPOUNDS APPLIED TO BRAZILIAN TROPICAL FORESTS AND SUBSTITUTION PLANTATIONS**
Tania Mascarenhas Tavares

P1.44 **CARBON FLUX ESTIMATION BY USING ACTM FOR THE PERIOD 1990-2011**
Tazu Saeki

P1.45 **SECONDARY ORGANIC AEROSOL FORMATION FROM STRESS-INDUCED BIOGENIC EMISSIONS AND POSSIBLE CLIMATE FEEDBACKS**
Thomas F. Mentel

P1.46 **MEASUREMENTS OF BIOGENIC VOLATILE ORGANIC COMPOUNDS IN AN OAK FOREST ECOSYSTEM IN SOUTHERN FRANCE IN SPRING 2014: OVERVIEW OF THE INTENSIVE CAMPAIGN**
Valerie Gros

P1.47 *YS* **THE WIND MEANDERING DURING DAILY CONDITIONS IN THE AMAZON REGION OF BRAZIL**
Viliam Cardoso da Silveira

P1.48 **EVIDENCE FOR OCEANIC EMISSIONS OF VOLATILE ORGANICS AND METHANESULFONIC ACID (MSA) OVER THE TROPICAL PACIFIC OCEAN**
Yuhang Wang

P1.49 **H2O AND CO2 FLOWS AND RELATIONS WITH CLIMATE VARIABLES IN THE AMAZON**
Glayson Francisco Bezerra das Chagas

P1.50 **THE ANALYSIS OF DRY DEPOSITION OF ACIDIFYING SUBSTANCES IN MALAYSIA"S GAW STATIONS**
Mohd Firdaus Jahaya

P1.51 **ASSESSMENT OF ATMOSPHERIC WET DEPOSITION AT CAPE POINT, SOUTH AFRICA**
Jan-Stefan Swartz

P1.52 **OBSERVATIONS OF ESSENTIAL CLIMATE VARIABLES AT THE GAW ATMOSPHERIC RESEARCH STATION AT MACE HEAD**
T. Gerard Spain

P1.53 **AIRBORNE MEASUREMENTS OF HCOOH IN THE EUROPEAN ARCTIC: A WINTER-SUMMER COMPARISON**
Benjamin Thomas Jones

P1.54 **CHLOROPHYLL-A AND OTHER OCEAN COLOR PRODUCTS AS PREDICTIVE TOOLS OF THE ORGANIC MASS FRACTION IN SUBMICRON SEA SPRAY**
Matteo Rinaldi

P1.55 **PHOSPHORUS SPECIATION IN ATMOSPHERIC DEPOSITION SAMPLES IN THE EASTERN MEDITERRANEAN: FLUXES, ORIGIN AND BIOGEOCHEMICAL IMPLICATIONS**
Kalliopi Violaki

P1.56 **ARCTIC SURFACE OZONE DEPLETIONS FROM OZONE SOUNDINGS**
David W. Tarasick

P1.57 **CLOUDLESS AND ALL-SKY DOWNWELLING BROADBAN AND SPECTRAL SOLAR IRRADIANCES PARTITION INTO DIRECT AND DIFFUSE OVER THE AMAZON FOREST: DIURNAL AND SEAONAL VARIABILITY**
Nilton M. Évora do Rosário

SESSION 2: ATMOSPHERIC CHEMISTRY AND THE COUPLING BETWEEN BIOGENIC AND ANTHROPOGENIC EMISSIONS

P2.1 *YS* **FUNGAL ORIGIN BIOAEROSOLS IDENTIFICATION IN THE CITY OF SÃO PAULO, BRAZIL**
Ana Paula Mendes Emygdio

P2.2 **GASEOUS ELEMENTAL MERCURY (GEM) MEASURED AT CAPE POINT FROM 2007 – 2011**
Andrew Venter

P2.3 *YS* **MEASUREMENTS OF IN-SITU SOA FORMATION AND CHEMISTRY USING AN OXIDATION FLOW REACTOR**
Brett B. Palm

P2.4 *GAW* **ANNUAL VARIABILITY OF THE CHEMICAL COMPOSITION OF AEROSOL IN A HIGH-ALTITUDE SITE IN THE SOUTH-AMERICAN TROPICS (CHACALTAYA, 5380 M.A.S.L.)**
Carina Isabel Moreno Rivadeneira

P2.5 *YS* **DAY/NIGHT ACID RAIN PROFILES IN A MID-SIZED ANDEAN CITY. ANALYSIS OF VOLCANIC AND ANTROPOGENIC PRECURSORS**
Carlos Mario Gonzalez

P2.6 **SEASONAL VARIATIONS OF BIOGENIC SECONDARY ORGANIC AEROSOL TRACERS FROM ISOPRENE AND MONOTERPENES IN CAPE HEDO, OKINAWA**
Chunmao Zhu

P2.7 *YS* **CHARACTERIZATION OF PARTICULATE MATTER AND GASEOUS POLLUTANTS AT MANAUS AND AMAZONIAN TALL TOWER OBSERVATORY (ATTO)**
Cybelli G. Gregório Barbosa

P2.8 *YS* **CLOUD DROPLET ACTIVATION AND HYGROSCOPICITY OF BIOGENIC AND ANTHROPOGENIC SECONDARY ORGANIC AEROSOL**
Defeng Zhao

P2.9 *YS* **PEROXYNITRATES FROM TELOMERICS ALDEHYDES**
Diana Patricia Henao Arboleda

P2.10 **MOLECULAR UNDERSTANDING OF NUCLEATION AT FREE TROPOSPHERIC CONDITION**
Duplissy Jonathan

P2.11 *YS* **BIOGENIC SOA FORMATION THROUGH GAS-PHASE OXIDATION AND GAS-TO-PARTICLE PARTITIONING – COMPARISON BETWEEN PROCESS MODELS OF VARYING COMPLEXITY**
Emilie Hermansson

P2.12 **CHEMICAL AND TOXICOLOGICAL CHARACTERIZATION OF DIESEL AND BIODIESEL COMBUSTION EMISSIONS FROM VEHICLES USING A NEW CONTROLLED EXPOSURE CHAMBER FOR IN SITU TOXICITY EVALUATION: EQUIPMENT VALIDATION AND FIRST RESULTS**
Fabian Andres Placencia Lobos

P2.13 *YS* **COMPARISON OF EMISSION FACTORS FOR PM2.5 AND PARTICLE SIZE DISTRIBUTION FROM THE COMBUSTION OF EUCALYPTUS GLOBULUS , NOTHOFAGUS OBLIQUA AND PINUS RADIATA USING CONTROLLED COMBUSTION CHAMBER 3CE**
Fabian Guerrero

P2.14 *YS* **VERTICAL PROFILES OF AEROSOL PROPERTIES AT THE MALDIVES CLIMATE OBSERVATORY HANIMAADHOO**
Friederike Höpner

P2.15 **APPLICATION OF A MODEL BASED SOURCE APPORTIONMENT TECHNIQUE TO TRACK FINE ORGANIC AEROSOL PARTICLES IN EUROPE.**
Giancarlo Ciarelli

P2.16 *YS* **OCCURRENCE OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE SÃO PAULO ATMOSPHERE: A COMPARATIVE STUDY - WINTER 2012/2013**
Guilherme Martins Pereira

P2.17 *YS* **EFFECTS OF AEROSOLS ON SATELLITE MEASUREMENTS OF HCHO COLUMNS**
Hyeong-Ahn Kwon

P2.18 **METHANE PROFILE OVER SOUTH AMERICA DURING THE BURNING SEASON: SATELLITE OBSERVATION AND AIRCRAFT VALIDATION IN THE LOWER TROPOSPHERE**
Igor Oliveira Ribeiro

P2.19 **SECONDARY ORGANIC AEROSOL FORMATION AND AGING THROUGH AQUEOUS PHASE GUAIACOL PHOTONITRATION**
Irena Grgic

P2.20 *YS* **HORIZONTAL AND VERTICAL (3D) DISTRIBUTION MEASUREMENTS OF TRACE GAS RATIOS AS INDICATOR FOR ANTHROPOGENIC/BIOGENIC VOC INFLUENCES ON OZONE/AEROSOL FORMATION RATES**
Ivan Ortega

P2.21 *YS* **EVOLUTION OF THE COMPLEX REFRACTIVE INDEX IN THE NEAR UV SPECTRAL REGION IN AGEING SECONDARY ORGANIC AEROSOL**
J. Michel Flores

P2.22 **HOW MUCH CAN WE LEARN ABOUT NITROUS OXIDE EMISSIONS FROM BASELINE SITES AND SIMPLE BOX MODELS?**
James W Elkins

P2.23 **FINE AND COARSE PARTICLES CONCENTRATION MEASURED DURING 2013 IN THE METROPOLITAN AREA OF SÃO PAULO.**
Janne Chu

P2.24 **OBSERVATIONS AND MODELING OF ATMOSPHERIC CHEMISTRY OVER NORTHEASTERN BRAZIL AT THE FEDERAL UNIVERSITY OF RIO GRANDE DO NORTE**
Judith Johanna Hoelzemann

P2.25 *YS* **THE HYGROSCOPICITY OF ATMOSPHERIC AEROSOL PARTICLES AND THE RELATION TO THE PRESENCE OF CLOUD CONDENSATION NUCLEI OVER A FOREST SITE IN JAPAN DURING SUMMER**
Kaori Kawana

P2.26 *YS* **REGIONAL DISTRIBUTION OF GLYOXAL OVER THE SOUTHEASTERN U.S.: FIRST HIGH RESOLUTION, IN-SITU AIRBORNE MEASUREMENTS**
Kyung-Eun Min

P2.27 *GAW* **COMPLEX GREENHOUSE GAS MONITORING AND RESEARCH PROGRAMS AT A WMO GAW TALL TOWER SITE IN CENTRAL EUROPE**
László Haszpra

P2.28 *YS* **TRANSPORT AND DISPERSION OF TROPOSPHERIC OZONE AND ITS EFFECTS ON THE SECONDARY METABOLISM OF TIBOUCHINA PULCHRA (CHAM.) COGN. IN THE METROPOLITAN AREA OF VALENCIA - SPAIN**
Lucia Helena Gomes Coelho

P2.29 *YS* **STOCHASTIC AND ARTIFICIAL INTELLIGENCE MODELS FOR FORECAST RESPIRABLE PARTICLES (PM2.5) ATMOSPHERIC IN DIFFERENT ZONES OF METROPOLITAN AREA OF RIO DE JANEIRO**
Luciana Maria Baptista Ventura

P2.30 **SO2 MEASUREMENTS IN AMAZONIA AND ITS RELATIONSHIP WITH AEROSOL PROPERTIES**
Luciana Varanda Rizzo

P2.31 *YS* **AIR QUALITY AND ECOSYSTEM EFFECTS OF VARYING AGRICULTURAL ATMOSPHERIC AMMONIA EMISSIONS IN THE UNITED STATES**
Luke Schiferl

P2.32 **PHENOL AND NITRO PHENOLS IN DOWNTOWN SANTIAGO**
Maria Angelica Rubio Campus

P2.33 **IMPROVING AIR QUALITY IN SANTIAGO, CHILE**
María Margarita Préndez Bolívar

P2.34 **EFFECT OF THE GOTHENBURG PROTOCOL MEASURES ON NMVOC EMISSION AND CONCENTRATION LEVELS IN THE CENTRAL EUROPE**
Milan Vana

P2.35 **VARIATION IN AMBIENT CARBONYLS IN BEIJING : 2005- 2012**
Min Shao

P2.36 **TOTAL OZONE TRENDS IN THE TROPICS 1974 - 2013**
Neusa Maria Paes Leme

P2.37 **IMPACT OF ASSIMILATING PARASOL FINE MODE AEROSOL OPTICAL DEPTH OVER LAND ON TOP-DOWN ESTIMATES OF AEROSOL EMISSIONS**
Nicolas Huneeus

P2.38 *YS* **PRELIMINARY RESULTS OF TOTAL OH REACTIVITY IN A MEDITERRANEAN OAK FOREST DURING LATE SPRING 2014**
Nora Zannoni

P2.39 *GAW* **DETERMINATION OF AREAS SOURCE OF ORIGIN OF THE AIR MASSES THAT AFFECT TO CUBAN WESTERN. THE NOX STUDY.**
Osvaldo Adolfo Cuesta Santos

P2.40 **ATMOSPHERIC INPUT AND SOLUBILITY OF TRACE METALS OVER THE EASTERN MEDITERRANEAN**
Panagiota Nikolaou

P2.41 *YS* **EVALUATION OF REGIONAL ISOPRENE EMISSION ESTIMATES IN CALIFORNIA BASED ON DIRECT AIRBORNE FLUX MEASUREMENTS**
Pawel Misztal

P2.42 *GAW* **SEASONAL AND INTERANNUAL EVOLUTION OF THE MONOACIDS ORGANICS IN THE ATMOSPHERE OF THE HUMID SAVANNA OF LAMTO (CÔTE D'IVOIRE)**
Pelemayo Raoul Toure

P2.43 *YS* **GLOBAL MONITORING OF HCOOH AND CH3OH BY IASI**
Pommier Matthieu

P2.44 *YS* **BRIDGING THE GAP BETWEEN MODELED AND OBSERVED ELEMENTAL COMPOSITION OF ORGANIC AEROSOL**
Qi Chen

P2.45 **REGIONAL MODELING OF THE LAND/OCEAN-ATMOSPHERE INTERACTION USING WRF-CHEM: IMPLEMENTATION OF HIGH RESOLUTION SURFACE EMISSIONS**
Rafael Pedro Fernandez

P2.46 **TRUE EMISSION FACTORS FOR FOREST FIRES AND THE ROLE OF NON-FIRE NOX**
Robert Bone Chatfield

P2.47 **EVIDENCE OF BIOMASS BURNING AEROSOLS TRANSPORTED FROM THE AMAZON TO THE CENTRAL ANDES (BOLIVIA)**
Ruben Marcos Mamani Paco

P2.48 **COMPARISON OF METHANE CONCENTRATIONS OBSERVED FROM SPACE WITH MODEL SIMULATION OVER MONSOON ASIA**
Sachiko Hayashida

P2.49 *YS* **CHEMICAL CHARACTERIZATION OF SUBMICRON AEROSOL PARTICLES WITH AEROSOL MASS SPECTROMETERS, LABORATORY AND FIELD STUDIES**
Samara Carbone

P2.50 **THE ROLE OF LAND COVER CLASSIFICATION ON WEATHER FORECASTING MODELS COUPLED WITH CHEMISTRY: A WRF-CHEM 3.2 BASED STUDY FOR THE AMAZONIAN AREA OF MANAUS, BRAZIL**
Sameh Adib Abou Rafee

P2.51 **STABLE CARBON ISOTOPE AND AMS STUDIES FOR TRANSBOUNDARY SOA IN WESTERN JAPAN**
Satoshi Irei

P2.52 **DEVELOPMENT AND EVALUATION OF A VEHICULAR EMISSIONS INVENTORY BASED IN TRAFFIC COUNTS FOR METROPOLITAN REGION OF SÃO PAULO**
Sergio Ibarra Espinosa

P2.53 *YS* **A PRELIMINARY ASSESSMENT OF PARTICULATE AIR POLLUTION IN JEDDAH, SAUDI ARABIA**
Shedrack R. Nayebare

P2.54 *YS* **TRACE GASES SOIL EMISSIONS AND GLOBAL WARMING POTENTIALS FROM VENEZUELAN CORN FIELDS UNDER TILLAGE AND NO-TILLAGE AGRICULTURE**
Sorena Marquina

P2.55 *YS* **REACTIVE AND NON-REACTIVE TRACE GAS PROFILES WITHIN AND ABOVE AN AMAZONIAN RAINFOREST**
Stefan Aiko Wolff

P2.56 **MASS SPECTRAL OBSERVATIONS OF SUBMICRON AEROSOL PARTICLES AND PRODUCTION OF SECONDARY ORGANIC AEROSOL AT AN ANTHROPOGENICALLY INFLUENCED SITE DURING THE WET SEASON OF GOAMAZON2014**
Suzane S. de Sá

P2.57 **EMISSIONS FACTORS OF GASEOUS POLLUTANTS FROM FLEXIBLE-FUEL LIGHT-DUTY VEHICLES**
Thiago Nogueira

P2.58 *YS* **HISTORICAL TRENDS IN AEROSOL WATER IN THE SOUTHEASTERN UNITED STATES**
Thien Khoi Vuong Nguyen

P2.59 **CORRELATION BETWEEN THE CARBON STOCK PRESENT IN THE SOILS OF THE TIJUCA NATIONAL FOREST AND ON THE CAMPUS OF THE FEDERAL RURAL UNIVERSITY OF RIO DE JANEIRO AND EMISSIONS OF GREENHOUSE GASES.**
Victor Satiro De Medeiros

P2.61 *YS* **TRANSPORT OF FIRE PLUMES TOWARD THE ARCTIC USING GLOBAL MODELLING**
Yoann Long

P2.62 **INTERCOMPARISON OF SECONDARY ORGANIC AEROSOL MODELS BASED ON SECONDARY ORGANIC AEROSOL TO ODD OXYGEN RATIO IN TOKYO**
Yu Morino

P2.63 **MASS CONCENTRATIONS OF ORGANIC AEROSOL AND PM2.5 IN EAST ASIA REPRODUCED BY USING VOLATILITY BASE-SET APPROACH IN THE WRF-CHEM MODEL**
Yugo Kanaya

P2.64 **ISOPRENE OXIDATION PRODUCTS MEASURED BY SV-TAG REVEAL DIFFERENCES IN CHEMISTRY AND PARTITIONING BETWEEN NATURAL AND POLLUTED ENVIRONMENTS**
Gabriel Isaacman-VanWertz

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Luca Pozzoli

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Marcos Froilan Andrade Flores

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Milan Vana

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P6.43 *YS* **EFFECTS OF CLIMATE CHANGE ON OZONE AND NITRIC ACID DEPOSITION**
Minjoong Kim

P6.44 **CLIMATOLOGY AND SYNOPTIC VARIABILITY OF OZONO AT CERRO TOLOLO**
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P6.45 **SOURCE CONTRIBUTION ANALYSIS OF BLACK CARBON AEROSOLS IN SOUTH ASIA AND SURROUNDING REGIONS**
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P6.48 *YS* **AEROSOL SIMULATIONS OF A NEW CHEMISTRY-CLIMATE MODEL (GRIMS-CHEM)**
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P6.49 *GAW* **TWENTY YEARS TRACE GAS AND AEROSOL MONITORING AT GAW GLOBAL SITE HOHENPEISSENBERG**
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P6.51 **ROLES OF TRANSPORT AND CHEMISTRY PROCESSES IN GLOBAL OZONE CHANGE ON MULTI-DECADAL TIME SCALE**
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P6.58 **REDUCING UNCERTAINTY IN MODEL BUDGETS OF TROPOSPHERIC OZONE AND OH**
Oliver Wild

P6.59 **CHEMICAL CLIMATE EVOLUTION ABOVE THE MEDITERRANEAN BASIN**
Ricaud Philippe

P6.60 **PREDICTION OF FUTURE OZONE AIR QUALITY IN SOUTHEAST ASIA USING THE NESTED REGIONAL CLIMATE MODEL WITH CHEMISTRY (NRCM-CHEM)**
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P6.61 **HUMANS VS NATURE AS DRIVERS OF TROPOSPHERIC GASES AND AEROSOL CHANGES OVER THE LAST THREE DECADES**
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P6.62 **LONG-TERM SURFACE OZONE VARIABILITY IN THE MEDITERRANEAN BASIN**
Paolo Cristofanelli

P6.63 **THE EFFECTS OF MID-LATITUDE STORMS ON TRACE GAS COMPOSITION USING THE MACC REANALYSIS DATASET**
Katherine Emma Knowland

KEYNOTE SPEAKERS ABSTRACTS

K1 - WHY DO WE DO THE (ATMOSPHERIC) SCIENCE WE DO?

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Atmospheric chemistry plays a central role in manyenvironmental issues of today. They include acid precipitation, ozone layerdepletion, air quality, and climate change. Atmospheric chemistry also touches other key issues such as waterquality, ecosystem health, and the general sustainability of earth system.Therefore, atmospheric chemistry is done not only as a curiosity driven sciencebut also as a science with a purpose. In this context, I argue that atmosphericchemistry falls in what is called the Pasteur's quadrant.[1]

I will discuss the major atmospheric processes, how theyinfluence environmental issues, and what it takes to take this science touseful and usable form. In addition, Iwill highlight the issues that are likely to be most useful and where further workis needed. These issues will be exemplifiedby using my own research and experiences over the past few decades.

K2 - GLOBAL ATMOSPHERIC WATCH - CELEBRATING 25 YEARS!

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The GlobalAtmosphere Watch (GAW) programme of WMO was established twenty-fiveyears ago. GAW is a partnership involving the Members of WMO, contributingnetworks and collaborating organizations and bodies which provides reliablescientific data and information on the chemical composition of the atmosphere,its natural and anthropogenic change, and helps to improve the understanding ofinteractions between the atmosphere, the oceans and the biosphere.

GAW focal areas are aerosols, greenhouse gases, selected reactive gases, ozone, UV radiation and precipitation chemistry (oratmospheric deposition). GAW supports the WMO GAW Urban Research Meteorology andEnvironment (GURME) project and works together the Group of Experts onScientific Aspects of Marine Environmental Protection (GESAMP) as well as providesSand and Dust Storms Warning (SDS-WAS). GAW is consideredthe atmospheric chemistry component of the Global Climate Observing System (GCOS).

In this talk we reflect on the evolution of the GAW programme and look forwardinto the decades to come.

K3 - STRONGLY GROWING AIR POLLUTION AND RELATED MORTALITY, ESPECIALLY IN ASIA

Lelieveld Jos; John S. Evans; Mohammed Fnais; Despina Giannadaki; Andrea Pozzer;
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Air pollution by hazardous gases andfine particulate matter (PM2.5) has increased strongly withindustrialization and urbanization. About 80% of the human population worldwideis exposed to PM2.5 concentrations that are higher than the guidelineconcentration by the World Health Organization (10 µg/m3) and 35% tomore than 25 µg/m3 (EU Directive). Recently, air pollution hasincreased at a particularly high pace in South and East Asia. We assess thepremature mortality and the years of human life lost caused by air pollution onregional and national scales, based on high-resolution global modelcalculations and the methodology of the Global Burden of Disease in 2010. Wedistinguish urban (including megacities) and non-urban air pollution relatedmortality, andestimate contributions by road traffic, industry, biomass burning, residential cookingand heating, power generation, agriculture and natural sources. It appears that the global mean per capita mortalitycaused by air pollution is about 5 deaths per 10,000 person-years (about halfof that caused by tobacco smoking). We also present projections for the future(2025 and 2050) based on a business-as-usual scenario, indicating a dramaticgrowth of air pollution related mortality, and suggesting the need for strong airquality control measures.

K4 - THE CLOSE LINKS BETWEEN THE BIOLOGICAL FUNCTIONING OF AMAZONIA AND ATMOSPHERIC CHEMISTRY

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Amazonia is a place where the biology of the forest andatmospheric chemistry are very well coupled. Feedbacks are very strong betweenecosystem functioning, trace gases and aerosol emissions, cloud cover,precipitation, radiation balance and other key issues. In the wet season, alarge portion of the Amazon region constitutes one of the most pristinecontinental areas, with very low concentrations of atmospheric trace gases andaerosol particles. The Large Scale Biosphere Atmosphere Experiment in Amazonia hasstudied the links between the functioning of the forest and the atmosphericcomposition for more than 20 years. Amazonian aerosols were characterized indetail, including aerosol size distributions, aerosol light absorption andscattering, optical depth and aerosol inorganic and organic composition, amongothers properties. Trace gases analyzedincludes VOCs, ozone and CO. The central Amazonia site showed low aerosolconcentrations (PM2.5 of 1.3±0.7 µg m-3 and 3.4±2.0 µg m-3in the wet and dry seasons), with a median particle number concentration of 220cm-3 in the wet season and 2,200 cm-3 in the dry season.Aerosol mass spectrometry shows that organic aerosol accounts to 81% to thenon-refractory PM1 aerosol loading. The trace elements associated with naturalbiogenic aerosols were K, P, Zn, and organic carbon. Aerosol light scatteringand absorption coefficients were very low during the wet season, increasing bya factor of 5, in the dry season due to long range transport of biomass burningaerosols reaching the forest site in the dry season. Aerosol single scatteringalbedo (SSA) is a low value of 0.84 in the wet season. The mean directradiative forcing of aerosols at the top of the atmosphere (TOA) during the dryseason was a significant -5.6±1.7 Wm-2, averaged over the AmazonBasin. This change in the radiation balance caused increases in the diffuseradiation flux, with an increase of Net Ecosystem Exchange (NEE) of 18 to 29%for relatively high AOD. From this analysis, it is clear that land use changein Amazonia shows alterations of many atmospheric properties, and these changesare affecting the functioning of the Amazonian ecosystem in significant ways.

INVITED SPEAKERS ABSTRACTS

SESSION 1 - ATMOSPHERE-SURFACE (OCEAN/VEGETATION/ICE) INTERACTIONS IN A CHANGING CLIMATE

I1.1 - PROGRESS IN UNDERSTANDING THE EMISSIONS, CHEMISTRY AND IMPACTS OF REACTIVE HALOGENS

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Emissions of very short lived halogenated species (VSLS) – halogenated compounds with atmospheric lifetimes of less than 6 months - lead to ozone loss in the marine and polar troposphere and in the lower stratosphere, and are calculated to contribute a negative radiative flux at the tropical tropopause. The atmospheric chemistry of these compounds may also have impacts on nitrogen oxide speciation and abundance in the troposphere, as well as on nucleation of new particles in the marine atmosphere. Recent laboratory data suggests that very short lived inorganic precursors dominate marine iodine emissions. Yet, in the marine tropical free troposphere, IO concentrations remain elevated above the ocean surface, and together with reactive bromine may contribute several tens of percent to total ozone loss over much of the troposphere. In polar regions, sources of reactive iodine are a subject of debate and so far cannot explain high atmospheric mixing ratios of iodine oxide radicals (IO) measured over Southern Ocean sea ice. This presentation discusses whether such observations ca

I1.2 - PROBING THE ATMOSPHERIC OXIDATION CAPACITY BASED ON AIRBORNE EDDY COVARIANCE MEASUREMENTS OF VOLATILE ORGANIC COMPOUNDS

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T. Karl1,2,+,*, P.K. Misztal3 Institute for Meteorology and Geophysics, University of Innsbruck, Innsbruck, Austria 2National Center for Atmospheric Research, Boulder, CO, USA 3University of California at Berkeley, Berkeley, CA, USA 4Center for Interdisciplinary Remotely-Piloted Aircraft Studies, Monterey, CA, USA now at the Institute for Meteorology and Geophysics, University of Innsbruck, Austria * corresponding author: Thomas Karl, Institute for Meteorology and Geophysics, University of Innsbruck, Innrain 52, 6020 Innsbruck, Austria, email: thomas.karl@uibk.ac.at Airborne flux measurements of VOC were performed over the Californian oak belts surrounding Central Valley. We demonstrate for the first time (1) the feasibility of airborne eddy covariance measurements of reactive biogenic volatile organic compounds, (2) the effect of chemistry on the vertical transport of reactive species, such as isoprene, and (3) the applicability of wavelet analysis to estimate regional fluxes of biogenic volatile organic compounds. These flux measurements demonstrate that instrumentation operating at slower response times (e.g. 1-5s) can potentially still be used to determine eddy covariance fluxes in the mixed layer above land, where typical length scales of 0.5-3 km were observed. Flux divergence of isoprene measured in the planetary boundary layer (PBL) is indicative of OH densities in the range of 4-7 x 106airborne fluxes to the surface with Dahmköhler numbers (ratio between the mixing timescale to the chemical timescale) in the range of 0.3-0.9. Most of the isoprene is oxidized in the PBL with entrainment fluxes of about 10% compared to the corresponding surface fluxes. Entrainment velocities of 1-10 cm/s were measured. We present implications for parameterizing PBL schemes of reactive species in regional and global models. , H.H. Jonsson4 , A.H. Goldstein3 and A.B. Guenther2 molecules / cm3 and allow extrapolation of

SESSION 2 - ATMOSPHERIC CHEMISTRY AND THE COUPLING BETWEEN BIOGENIC AND ANTHROPOGENIC EMISSIONS

I2.1 - ATMOSPHERE-BIOSPHERE INTERACTIONS DURING SOAS THROUGH MULTIPHASE CHEMISTRY

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Gas phase water-soluble organic matter (WSOMg) and aerosol liquid water (ALW) are ubiquitous and abundant in the troposphere. Anthropogenic pollution drives fine mode ALW mass concentrations in the Eastern U.S. that impair visibility, affect regional climate, alter the local hydrological cycle and potentially modulate summertime organic particulate matter (PM) formation. Recent measurements during the Southern Oxidant and Aerosol Study (SOAS) from June 1 –July 15, 2013 indicate that liquid water was present inevery aerosol sample. Campaign average ALW mass concentrations range from 1-5 μg m-3, but were as high as73 μg m-3.When days with precipitation are excluded, ALW mass concentrations range from 3–20 μg m-3. Hygroscopic growth factors exhibita diurnal pattern and exceed 2 on most days from 7-9am (local time), driven byRH and diel cycling in the hygroscopicity parameter kappa from 0.1 – 0.5 on the time scale of hours. During SOAS we observe that more than 90% of the organic aerosol mass is water-soluble and that aerosol mass spectrometry (AMS) measuredIEPOX, an indicator of biogenically-derived secondary organic aerosol (SOA), is linked with particle phase liquid water. The ability of inorganic aerosol species to increase ALW is well-established and routinely included in atmospheric models; however WSOMg partitioning to this water and subsequent SOA formation is not. SOAS findings are not inconsistent with the hypothesis that ALWis anthropogenic and provide a mechanism by which anthropogenic pollutants may facilitate transfer of organic compounds, derived predominantly from the biosphere, from the gas phase to the particle phase. The previously reported estimate of the controllable fraction of biogenic SOA in the Eastern U.S.(50%), which did not include WSOMg partitioning to aerosol liquid water, may be too low.

I2.2 - NOCTURNAL BIOGENIC VOC OXIDATION IN THE RESIDUAL LAYER: NIGHT FLIGHTS IN THE SOUTHEAST U.S. DURING SENEX 2013

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Oxidationof biogenic hydrocarbons, BVOC, by the nitrate radical, NO3, representsan important but highly uncertain mechanism by which anthropogenic (i.e., NOx)and biogenic emissions interact. Forexample, some model studies suggest large organic aerosol mass attributable to NO3-BVOCreactions, but estimates from different models vary widely. One key uncertainty is the nighttimeoxidation of BVOC in the residual boundary layer, where a large mass of BVOCfrom the previous day's emission resides, but where measurements are extremelysparse.

TheSENEX campaign took place in June and July of 2013 in the southeast U.S., aregion with large biogenic and anthropogenic emissions. There were several nighttime research flightsof the NOAA P-3 aircraft that extensively sampled the residual layer, and thatoccasionally probed the nocturnal boundary layer during low approaches toairfields. Measurements includedspeciated BVOC, nighttime oxidants (NO3 and O3), BVOCoxidation products and aerosol mass and composition. This presentation will examine budgets fornighttime BVOC oxidation, particularly in the residual layer. It will address competition between NO3and O3, the potential for organic nitrate and organic aerosolformation, and the changes in nighttime oxidative capacity that has resultedfrom declining anthropogenic emissions of NOx in the U.S.

SESSION 3 - INTERACTIONS BETWEEN AEROSOLS, CLOUDS AND PRECIPITATION

I3.1 - THE CHEMICAL AND PHYSICAL EVOLUTION OF COMPLEX CLOUD CONDENSATION NUCLEI

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Akua Asa-Awuku Bourns College of Engineering (CE-CERT), University of California-Riverside, Riverside, CA, USA 92521 Particle number, size, and chemical composition information is important for constraining and predicting cloud condensation nuclei concentrations. The more complex the aerosol source, the more difficult it becomes to understand the changing chemical and physical properties of the cloud condensation nuclei (CCN). In this presentation we examine the chemical and physical evolution of CCN from controlled laboratory and aged chamber sources. Chamber experiments were conducted at the UC-Riverside Center for Environmental Research and Technology (CE-CERT) Atmospheric Processes Lab. The nature and prediction of organic CCN are discussed. Specifically, the impact of surface tension, mixing state, and particle morphology of aerosol from a diverse set of sources are presented. The effects on extended ?-Köhler theory and the observed hygroscopicity, ? are shown. Results indicate that prevalent assumptions can shift the perceived the hygroscopicity parameter ? by 0.15 or more.

I3.2 - PROCESS LEVEL ANALYSIS OF INVIGORATION IN WARM CONVECTIVE CLOUDS

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Cloudinvigoration hypothesis links changes in aerosol loading to changes inconvective cloud size, vertical extent and precipitation patterns. It suggeststhat aerosol effects on the droplets size distribution in the micro-scale are coupledto dynamical processes such that it affects the macro-scale water massdistribution of the cloud.

Invigorationsuggests that clouds forming under polluted conditions are larger and formstronger rain-rates. Out of the variety of all aerosol effects on clouds, it isone of the most debated. Most studies that showinvigoration focus mainly on deep convective clouds that have mixed and coldphase regions, while similar studies on warm convective clouds showcontradicting evidences.

Here we closelyanalyze the co-evolution in time and space of the cloud's key processes. It isdone for different thermodynamic conditions, allowing us to understand thesynergetic effects of aerosol and environmental setting. Such analysis providesnew insight on processes that link micro and macro scales in the cloud, settingthe stage for understanding why and wheninvigoration can be expected.

SESSION 4 - ATMOSPHERIC CHEMISTRY AND URBANIZATION: FROM LOCAL TO THE GLOBAL SCALES

I4.1 - MODELLING DIFFERENT SPATIAL SCALES

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The European FP7 project CityZen ended a long time ago, but the environmental issues related to megacities live on. In regard to atmospheric science, these issues necessitate concerted research on different spatial domains, all the way from local to global scales. They comprise important research topics within air quality and climate science as well as interactions between air pollution and climate change. Real solutions to these issues must be found through improved communication between science, policy makers, the industry and society as a whole. In this presentation the main outcomes of the CityZen project will be presented briefly, and various examples will be given of how research on the topics, which were addressed in CityZen, has continued through numerous other programmes, such as the EU-FP7 projects MACC-II, PANDA, PEGASOS, and IMPACT2C, but also within the EMEP programme under the UN ECE, in the recent past. Emphasis will be put on climate-chemistry interactions and the couplings between different spatial scales, but the policy dialogue will also be touched upon.

I4.2 - COMBINING GREENHOUSE GASES EMISSION MITIGATION AND HEALTH CO-BENEFITS DUE TO REDUCTION OF LOCAL AIR POLLUTANTS: A GLOBAL PERSPECTIVE

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Health co-benefits of policies designed to reduceGHG emissions are well recognized. Active transportation,improvements in household energy efficiency and low emission powerplants are classic examples of measures that promote significant andimmediate positive effects on human health.

However, the magnitude ofhealth co-benefits of GHG mitigation varies significantly across theglobe. Differences in the technology employed to produce energy andmobility lead to a condition that for a given amount of GHG emissiondeveloping countries usually produce substantiallyhigher levels ofparticles and ozone precursors, ambient pollutants with robustassociations with adverse health effects. High population density andhigh levels of ambient air pollution is a frequent combination in themegacities of developing countries, increasing

the vulnerability ofurban dwellers in these hot spots of elevated exposure intensity.Thus, GHG policies that result in simultaneous reduction in local airpollutants have a marked positive health impact particularly inregions with low technologic efficiency. These health benefits reducethe economic burden of disease and should be taken into account whenimplementing public policies aimed to GHG mitigation, mainly in ascenario where local governances deal with limited resources. In thispresentation, local examples will be presented to illustrate thepotential use of health co-benefits to drive GHG mitigation policies.In addition, some aspects of the global pattern of technologicalinefficiency of energy production will be presented to provide asnapshot of where scientific and technologic partnerships willpromote significant health co-benefits.

I4.3 - AIR POLLUTION IN CHINA: SCIENTIFIC AND PUBLIC POLICY CHALLENGES

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Sever air pollution in China has in recent years caused intensive public, media and governmental attention. Many questions need to be answered about the air pollution in China, such as how harmful is the air pollution, especially PM2.5? Why suddenly so many reports about sever air pollution, is the air in China getting more polluted? How to design a policy that can control the air pollution most efficiently?

After updated the national Ambient Air Quality Standards in 2012 and included PM2.5 as one of the critical air pollutants, in 2013, Chinese central government released for the first time the “Air Pollution Prevention and Control Action Plan”. The plan has set goals to reduce annual mean concentration of PM2.5 up to 25% in 2017 in different regions in China. If the ambitious goals were achieved, this could be the most significant air pollution reduction in such a short time that affects so many people in human history.

To achieve these goals, however, there are enormous scientific and public policy challenges to deal with. For example:

Identify the key components, size fraction of PM that have the largest health effects; and identify the sources of PM that has the most harmful effects on human health and ecosystem.

Reduce the uncertainty in health risk assessment.

Understand complicate chemical transformation processes in air pollution formation with intensive emissions from industry, power plant, vehicles, agriculture.

Interactions between air pollution, PBL, and atmospheric circulation at different scales. The accountability, feasibility, effectiveness, and efficiency of air pollution control policies. Integrate multi-pollutant control and achieve co-benefit with climate and energy policy. Regional coordinated air pollution control.The largest challenge in China for air pollution control remains how to strength the link between science and policy.

SESSION 5 - ATMOSPHERIC CHEMISTRY FUNDAMENTALS

I5.1 - THE ROLE OF CRIEGEE INTERMEDIATES IN TROPOSPHERIC CHEMISTRY

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Carbonyl oxides, known as “Criegee intermediates” after Rudolf Criegee, who proposed their participation in ozonolysis,1 are important species in tropospheric chemistry. Most carbonyl oxides in the troposphere are produced by ozonolysis, but other tropospheric reactions can also produce Criegee intermediates.2, 3 However, until recently2, 4 no Criegee intermediate had been observed in the gas phase, and information about the reactivity of Criegee intermediates in gas-phase ozonolysis or in the troposphere have relied on indirect determinations.5, 6

In this work, the reactions of the three simplest Criegee intermediates, CH2OO, CH3CH2OO, CH3CHCH2OO with NO2, NO, H2O and R1R2C(O) and SO2 have been measured by laser photolysis / tunable synchrotron photoionization mass spectrometry. Diiodomethane, Diiodoethane and diiodopropane photolysis produces RI radicals, which react with O2 to yield ROO + I, where R = CH2,CH3CH2 and CH3CH2CHOO The Criegee intermediates are reacted with a large excess of SO2 and both the disappearance of Criegee intermediates and the formation of reaction products are observed by time-resolved photoionization mass spectrometry, as shown in figure 1. Rate coefficients at 298 K (and 4 Torr) of (3.9 ± 0.7) × 10-11 cm3 molecule-1 s-1 for CH2OO + SO2 and of (2.4 ± 0.3) × 10-11 cm3 molecule-1 s-1 for CH3CH2OO + SO2 and of (1.1 ± 0.3) × 10-10 cm3 molecule-1 s-1 for CH3CH2CHOO + SO2 have been obtained.

The reaction pathways that these Criegee intermediates follow, on production from ozonolysis of carbon-carbon double bonds in the atmosphere, play a pivotal role in shaping the composition of the Earth’s lower atmosphere. The direct measurements of the reactivity of CIs2,7,8 have shown that reactivity of CI is orders of magnitude higher than previously thought. Thus the oxidative flux of the atmosphere through CIs will play a significant role in governing atmospheric composition. Placing the present results into a tropospheric chemistry model8 implies a substantial role of Criegee intermediates in sulfate chemistry and Organic acids. In this work we will show that CIs have a significant impact on aerosol formation in the atmosphere.

References

(1) Criegee, R.; Wenner, G. Liebigs. Ann. Chem. 1949, 564, 9.
(2) Welz et al., Science 2012, 335, 204.
(3) Asatryan; Bozzelli, Phys. Chem. Chem. Phys. 2008, 10, 1769.
Fig. 1. The photoionization spectrum for the production of hydroxyl acetone formed from the unimolecular decomposition of acetone oxide.
(4) Taatjeset al., J. Am. Chem. Soc., 2008, 130, 11883.

(5) Johnson and Marston, Chem. Soc. Rev. 2008, 37, 699.
(6) Donahue et al., Phys. Chem. Chem. Phys. 2011, 13, 10848.
(7) Taatjes, et al., Science 2013, 340, 177.
(8) Percival et al., Faraday Discussions, 2013, 165, 45.

I5.2 - HETEROGENEOUS CHEMISTRY OF ISOPRENE-DERIVED EPOXIDES LEADING TO SECONDARY ORGANIC AEROSOL FORMATION

Jason Douglas Surratt; Ying-Hsuan Lin; Sri Hapsari Budisulistiorini; Theran P. Riedel; Matthieu Riva; Xinxin Li; Tianqu Cui; Zhenfa Zhang; Haofei Zhang; Weruka Rattanavaraha; Maiko Arashiro; Avram Gold
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Isoprene is now recognized as a source of secondary organic aerosol (SOA). Increasing our fundamental chemical understanding of isoprene-derived SOA formation is key to improving existing air quality models, especially in the southeastern U.S. where models currently underestimate observations. By combining organic synthesis, computational calculations, mass spectrometry, smog chamber studies, flow tube studies and field measurements, we show that reactive epoxides, which include methacrylic acid epoxide (MAE) and isomeric isoprene epoxydiols (IEPOX), produced from the photochemical oxidation of isoprene are key to SOA formation. Furthermore, anthropogenic pollutants (sulfate aerosol) enhance isoprene-derived epoxides as an SOA source. In the laboratory, we find that the reactive uptake of synthetic IEPOX and MAE onto acidified sulfate aerosol yields known isoprene-derived SOA tracers (2-methlytetrols, 2-methylglyceric acid, C5-alkene triols, 3-methyltetrahydrofuran-3,4-diols, dimers and organosulfates) that we measure in fine aerosol collected from multiple sites (i.e., Atlanta, GA, Yorkville,GA, Look Rock, TN, Centerville, AL, and Birmingham, AL) across the southeastern U.S. using gas chromatography/mass spectrometry (GC/MS) and liquid chromatography coupled to diode array detection and electrospray ionization high-resolution quadrupole time-of-flight mass spectrometry (LC/DAD-ESI-QTOFMS). Notably, IEPOX- and MAE-derived SOA tracers account for a significant mass fraction (10-20%) of ambient organic aerosol. Moreover, real-time continuous chemical measurements of fine aerosol made using an Aerodyne Aerosol Chemical Speciation Monitor (ACSM) during summers 2011 and 2013 resolved an IEPOX-oxygenated organic aerosol (IEPOX-OOA) factor when applying positive matrix factorization (PMF) to the organic mass spectral time series. This factor is found to account for upwards of 33% of the fine OA mass in certain locations and is strongly correlated with IEPOX-derived SOA tracers and sulfate, and to some extent with aerosol acidity. We have also investigated the heterogeneous kinetics of MAE and trans -b-IEPOX using a flow reactor coupled to the HR-ToF-CIMS and a scanning electrical mobility sizing system (SEMS). The reaction probability, also called the reactive uptake coefficient, is calculated for MAE and IEPOX on 1-2 component aerosol particles under various aerosol compositions and environmental conditions in order to probe the chemical drivers of the epoxide uptake. Implications of this chemistry on air quality, climate, and human health will be discussed.

SESSION 6 - ATMOSPHERIC CHEMISTRY IN A CHANGING CLIMATE

I6.1 - CONNECTING CLIMATE CHANGE, AIR POLLUTION, AND HUMAN HEALTH

J. Jason West; Raquel A Silva; Steven J. Smith; Yuqiang Zhang; Vaishali Naik; Susan C. Anenberg; Zachariah Adelman; Meridith M. Fry; Larry W. Horowitz; Jean-Francois Lamarque; Drew Shindell;
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Climate and air pollution areinterrelated: i.) air pollutants affectclimate, ii.) climate changeinfluences air pollution, and iii.)the major sources of air pollutants and greenhouse gases (GHGs) are shared suchthat actions to address emissions of one type of pollutant often influences theother. Here we quantify some of theselinkages to understand their importance, highlighting effects on humanhealth. We use the ACCMIP ensemble ofglobal chemistry-climate models (simulations for 2000 relative to 1850) to estimatethat at present 470,000 (140,000-900,000) people die prematurely each year dueto anthropogenic outdoor ozone, with 2.1 (1.3-3.0) million deaths annually dueto anthropogenic PM2.5. Pastclimate change is estimated to have had only a small influence on these totals,with different models disagreeing on the sign of the climate influence. We then show new findings of future airpollution health impacts, and of the contribution of projected future climatechange, using the ACCMIP simulations of future air quality under the RCPscenarios.

We then present theco-benefits of global GHG mitigation for global air quality and human health, estimatedfor the first time via two mechanisms: reducing co-emitted air pollutants, andslowing climate change and its influence on air quality. RCP4.5 is analyzed as a global mitigationscenario relative to its reference scenario, and we find that this mitigation avoids0.5±0.2, 1.3±0.5, and 2.2±0.8 million air pollution related deaths in 2030,2050, and 2100. When monetized, thesehealth benefits exceed the GHG mitigation costs in 2030 and 2050. We also find that the co-benefits of reducingco-emitted air pollutants far exceed the co-benefits via slowing climatechange. Results from our continued workto downscale these co-benefits results to the United States will also bepresented, allowing understanding of co-benefits at finer spatial resolutionand of the co-benefits from domestic versus foreign GHG reductions.

I6.2 - HERDING CATS OR HERDING SHEEP? A MULTI-MODEL PERSPECTIVE ON TROPOSPHERIC OZONE

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Various global multi-model studies have investigated troposphericozone changes over multi-decadal timescales. Several robust features emerge,which – for instance – allows the IPCC to associate high confidence in theradiative forcing associated with ozone increases between 1750 and the presentday. However, such quantities hide the spread in results between differentmodels, particularly when looking at seasonal and regional scales, and includingfor comparisons with observations. What can we learn about our scientificunderstanding from the model spread? What can we learn about models from themodel spread? And can we make recommendations for deficient or missingprocesses if we wish to use our models for environmental prediction? Of course,these questions also have to be asked in the context of what we want the model(s)to do (air quality, climate, stratospheric ozone depletion etc.).

My presentation will draw on results frommulti-model experiments conducted in support of the most recent IPCC report(CMIP5 and ACCMIP), with an eye to the expected outcomes from the ongoingChemistry-Climate Model Initiative (CCMI) model simulations.

ORAL ABSTRACTS

SESSION 1 - ATMOSPHERE-SURFACE (OCEAN/VEGETATION/ICE) INTERACTIONS IN A CHANGING CLIMATE

S1.1 - IN-SITU AND SATELLITE OBSERVATIONS IN THE AMAZON BASIN AND VARIATIONAL INVERSE MODELLING INDICATE INCREASED DRY-SEASON EMISSIONS OF METHANE

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Methane(CH4) is a greenhouse gas that is emitted from a range of anthropogenic andnatural sources, and since the industrial revolution its mean atmosphericconcentration has climbed dramatically. CH4 produces a relatively highradiative forcing effect upon the Earth's climate, and its atmospheric lifetimeof approximately 10 years makes it an appealing target for the mitigation ofclimate change.

However,the spatial and temporal variation of CH4 emissions are not well understood,though in recent years a number of top-down and bottom-up studies haveattempted to construct improved emission budgets. However, some top-downstudies suffer from poor observational coverage near the Amazon basin, particularlyin the planetary boundary layer. Since emissions from this region, comingmainly from wetland and burning sources, are thought to be relatively high,additional observations in this region would greatly help to constrain thegeographical distribution of the global CH4 emission budget. To this end, regularflask measurements of CH4 and other trace gases have been taken during flightsover four Amazonian sites since 2010, as part of the AMAZONICA project.Meanwhile, the GOSAT satellite has been used to retrieve global column-averageCH4 concentrations since mid-2009.

Wepresent an assessment of Amazonian methane emissions for 2010 and 2011 usingthe TOMCAT Chemical Transport Model and the new variational inverse model,INVICAT. These models are used to attribute methane variations at each Amazon siteto a source type and region, to assess the ability of our current CH4 fluxestimates to reproduce these observations and to produce improved posterioremission estimates through assimilation of atmospheric observations. This studyrepresents the first use of the INVICAT scheme to constrain emissions of anyatmospheric trace gas. Whilst there is generally good agreement between themodel and the observations prior to data assimilation, some high-methane eventsindicated by the observations are not captured by the model. We assimilate observationsfrom the NOAA surface measurement network, from the AMAZONICA aircraft and fromGOSAT, and find that tropical South American CH4 emissions approach 50Tg(CH4)/yr, ~10 Tg(CH4)/yr larger than first thought, largely due tolarger-than-expected emissions in the local dry season.

S1.2 - NITROUS OXIDE RELEASE FROM AGROPRODUCTION OF BIODIESEL CONFIRMS GLOBAL WARMING REDUCTION BY REPLACING FOSSIL FUELS IN NORTHEAST BRAZIL

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Brazil is among the world leaders in biofuel production.Biodiesel is produced from soybean in the tropical shrub forest, and also byother oilseed plantations (castor and sunflower seed) in the semiaridzone. Nitrous oxide, N2O, is a greenhouse gas with an averageglobal warming potential (GWP) 300 times larger than an equal mass of CO2 ina 100years horizon. The main source of N2O is nitrogen fixation insoil by bacteria, which is enhanced by the use of nitrogen chemicalfertilization. Thus the advantage of CO2 saved by the use ofbiofuels has been questioned due to the release of N2O [1].

Comparisonsof measured N2O fluxes from the original tropical forested areas andfrom experimental fields of substitution plantations under controlledconditions were made as follows: Atlantic forest (in an area of transition tothe semiarid zone) and in two areas changed for castor oil and sunflowerplantations for biodiesel; Cerrado, a semiarid shrub forest, and an areachanged to soybean plantation. For social purposes evaluation, measurementswere undertaken in cassava plantation which substituted former forested areas.Sampling design consisted of intensive five-day sampling campaigns in parallelat the native forest and the substituted plantation in each region.

Sampling andanalytical methodology were the same for all measurements: N2Oemitted from the soil was collected using staticchambers. N2O was determined by gas chromatographywith electron capture detection.

Taking inconsideration local agricultural modern practices as well as variation in N2Oemissionsfrom plantation cycle period, diurnal variations, differences between plantedlines (where chemical fertilization or bacteria inoculated seeding for soybeantakes place) and alleys between planted lines and the period of plantationrest, N2O mean fluxes and annual emissions from the original forestsproved to be higher than those of all oilseed plantations studied, and alsofrom cassava plantation, indicating that the substitution of original tropicalforest by different plantations for agro-biodiesel production- or even bysubsistence crop -reduces N2O emissions from soil, and thus does notnegate global warming reduction of replacing fossil fuels.

S1.3 - FIRE AND SMOKE IN THE AMAZON BASIN: A COMBINED STATISTICS

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Informationof fires retrieved from satellites could be a very useful tool in monitoringsmoke loading in major biomass burring regions. This study analyzed a combinedstatistics of fire and smoke loading during burningseasons (June-November) for 2002-2012 in the Amazon Basin using MODIS andAERONET observations. A significant positive correlation (~0.92) between firecounts and aerosol optical depth (AOD) indicate that the majority of aerosolsduring burning season are produced by fire. The correlations are enhanced whenthe analysis is performed at coarser spatial and temporal resolutions, possiblydue to dispersion/advection of smoke, which nullifies small variations betweenfire and smoke when looks at longer time and larger spatial scales. The firecounts for a 10x10 pixel regions shows maximumcorrelation with the AOD measured at regions ~100-200 km westward from thelocation of the fire. This result could be understood as dynamics associatedwith westward advection of smoke aerosols from each fire location.

S1.4 - OBSERVATIONS OF ATMOSPHERIC ACETONITRILE IN THE MID-LATITUDES OF THE SOUTHERN HEMISPHERE AND ITS GLOBAL DISTRIBUTION AWAY FROM BIOMASS BURNING INFLUENCES

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New measurements of acetonitrile from eight campaigns in the Southern Hemisphere are presented. These increase the available Southern Hemisphere acetonitrile observations made away from biomass burning plumes (that is, in the background troposphere) from 36 days to over 300 days coverage. These observations are combined with existing observations in background air from the Southern and Northern Hemispheres to provide, for the first time, a global view of acetonitrile in the background atmosphere. The mean mixing ratio of acetonitrile in the unpolluted troposphere of the Southern Hemisphere is less than half of that in the Northern Hemisphere, and may be lower still due to the absence of observations in the southern polar regions. In both hemispheres there is a decrease in acetonitrile in background air moving from the tropics to temperate latitudes. Both these features are consistent with the major source of acetonitrile being biomass burning in the tropics, mainly in the Northern Hemisphere. The observations in urban areas of both hemispheres show greater acetonitrile concentrations in some cities compared with the background atmosphere. This appears to be due to local biomass burning. Comparisons conducted with a two-hemisphere atmospheric box model indicate that the biomass burning source and sinks, both by dry deposition over the continents and destruction within the oceans, are required to match the observations.

S1.5 - SPATIO-TEMPORAL VARIABILITY OF BIOGENIC ISOPRENE EMISSIONS AND THEIR IMPACT ON ATMOSPHERIC CHEMICAL COMPOSITION

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The Model of Emissions ofGases and Aerosols from Nature (MEGANv2.1) together with the Modern-Era RetrospectiveAnalysis for Research and Applications (MERRA) meteorological fields was usedto estimate biogenic VOC emissions over the period of 30 years.

The estimates of isoprene, themost abundant biogenic VOC species, from four different emission datasets werestudied in more detail with special focus on spatial and temporal emissionpatterns. In addition to MEGAN-MACC inventory we selected two other bottom-upinventories (GUESS-ES, BISA-bottom-up) and one top-down inventory(BISA-top-down) for the comparison. Both BISA datasets were calculated by theMEGAN model driven by the ECMWF meteorological fields. The BISA-top-downemissions were constrained with the satellite retrievals of formaldehyde byapplying the inverse modeling technique in the chemical transport modelIMAGESv2. The GUESS-ES dataset was calculated by an emission model coupled withthe dynamic global vegetation model LPJ-GUESS. The comparison of emissiondistribution in different geographical regions shows substantial discrepanciesbetween the datasets with differences in total emissions up to factor of 2-3.

Isoprene estimates from allmentioned datasets were used in the chemical transport model MOZARTv3.5 and theimpact of different isoprene emission levels on concentration of atmospheric chemicalspecies such as formaldehyde, carbon monoxide and tropospheric ozone wasstudied. Comparison of the MOZART model results with satellite observations ofthese species will be discussed.

S1.6 - MARINE PRIMARY AND SECONDARY AEROSOL EMISSIONS RELATED TO SEAWATER BIOGEOCHEMISTRY FROM A MESOCOSM STUDY

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Marine aerosol particles contribute significantly to the global aerosol load and consequently has an important impact on both the Earth's albedo and climate. Different factors influence the way they are produced from the sea water and transferred to the atmosphere. The sea state (whitecap coverage) and sea water temperature influence the size and concentration of primarily produced particles, but also biogeochemical characteristics of the sea water may influence both the physical and chemical fluxes. In order to study marine emissions, one approach is to use semicontrolled environments such as mesocosms. Within the SAM project (Sources of marine Aerosol in the Mediterranean), we characterize the primary Sea Salt Aerosol (SSA) and Secondary aerosol formation by nucleation during mesocosms experiments performed in May 2013 at the Oceanographic and Marine Station STARESO in western Corsica. We followed both water and air characteristics of three mesocosms containing an immerged part filled with 3,3 m3 of sea water and an emerged part flushed with filtered natural air. While one of these mesocosms was left unchanged as control, the two others were enriched by addition of nitrates and phosphates respecting Redfield ratio (N:P = 16) in order to create different levels of phytoplanctonic activities. Water temperature, conductivity, pH, incident light, fluorescence of chlorophyll a, and dissolved oxygen concentration was monitored throughout the experiment. Mesocosm's waters were daily sampled for chemical (DOC, CDOM, TEP and nutrients) and biological (chlorophyll a, virus, bacteria, phytoplankton and zooplankton) analyses. Secondary new particle formation was followed on-line in the emerged parts of the mesocosms, while primary SSA production was simulated, in a dedicated set-up, by bubble bursting from sea water samples collected every day.

The size segregated aerosol number fluxes, cloud condensation nuclei (CCN) fluxes, and biological and organic contents of the aerosol were determined as a function of the sea water characteristics. The preliminary results evidence a weak correlation of the primary aerosol organic fraction in the CCN sizes with Chl-a, but a stronger dependence on the heterotrophe flagellates and virus population of the mesocosms.

S1.7 - IN SITU MEASUREMENT OF AIR-SEA EXCHANGE OF VOLATILE ORGANIC COMPOUNDS BY PTR-MS COUPLED WITH GRADIENT FLUX TECHNIQUE IN THE PACIFIC OCEAN

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We developed a new method for in situ measurement of air-sea fluxes of multiplevolatile organic compounds (VOCs) by combining proton transfer reaction-massspectrometry (PTR-MS) and gradient flux (GF) technique. The PTR-MS/GF systemwas deployed to determine the air-sea flux of VOCs in the open ocean, inaddition to carbon dioxide and water vapor. Vertical profiles of VOCs wereobtained by measurements at 7 heights from 1 to 1400 cm with a profiling buoy, witheach profiling time of approximately 7 min. Starting in 2010, we made fieldobservations during five research cruises in the Pacific Ocean by R/VHakuho-Maru (KH-10-1, KH-11-10, KH-12-1, KH-12-4, and KH-13-7), and observedair-sea fluxes at more than 10 locations in the South Pacific Ocean, theequatorial Pacific Ocean, and North Pacific Ocean. The vertical gradientobserved was significant for dimethyl sulfide (DMS) and acetone with thebest-fit curves on quasi-logarithmic relationship. The DMS fluxes were positiveat all locations, and substantially varied in the range of 0.1–30 mmol m–2 d–1. Theobserved fluxes are in general in accordance with those reported by previousexpeditions. In contrast, the acetone fluxes varied from negative to positive, dependingon locations, suggesting that the tropical and subtropical Pacific Oceans are asource, while the North Pacific Ocean is a sink for acetone.

S1.8 - VOLATILE ORGANIC COMPOUNDS EMISSION FROM LIGHT-INDUCED REACTIONS AT THE SEA SURFACE MICROLAYER

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Thesea surface microlayer is the organic-enriched layer present at the air-seainterface which has different physical and chemical properties compared tosubsurface waters1. The chemical analysis of this microlayer is of great interest for many reasonsincluding its major influence to reduce air–sea gas exchange. Surface seawatercontains a variety of substances which act as photosensitizers. They includecomponents of the dissolved organic matter known also as humic acids. The seasurface microlayer is the primary recipient of the solar energy and since it isenriched in chemicals and biota, a number of processes are likely to be moreeffective here than in the water column2.

The focus of this study is to determine if the organicfilm acts as a hydrophobic barrier for the air-sea gas exchange and to identifyand characterize the volatile organic compounds emissions due to thephotochemical processing of the sea surface microlayer. Synthetic saltsolutions containing a photosensitizer (humic acids) and an organic surfactant(nonanoic acid) have been irradiated by a Xe lamp, the VOCs being furtheridentified and analyzed by a High Resolution PTR-ToFMS.

It has been observed that the presenceof a thick organic film on the salt solutions reduces the transfer from theaqueous solution to the gas phase.

Theformation of certain saturated and unsaturated aldehydes, acids and a series ofalkenes and dienes have been observed. All these compounds were confirmed byGC/MS analysis. An isoprene formation was also observed under irradiation. Theisoprene is formed only in the presence of the organic surfactant with the needfor the photosensitizer. The dependence of the isoprene concentration with thesurfactant concentration and its surface tension is shown and discussed.

1. Donaldson, D. J. & George, C., Environ.Sci. Technol. 46,10385–10389, 2012.
2. Liss, P.S. & Duce, R. A. Cambridge University Press, Cambridge, 1997.

SESSION 2 - ATMOSPHERIC CHEMISTRY AND THE COUPLING BETWEEN BIOGENIC AND ANTHROPOGENIC EMISSIONS

S2.1 - IMPACT OF EMISSIONS AND CLIMATE STRESSORS ON THE ATMOSPHERIC AEROSOL COMPOSITION DURING THE 2012 PEGASOS FIELD CAMPAIGN

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Secondary inorganic and organicparticles are ubiquitous in the atmosphere and account for the largest fractionof submicron particulate matter (PM) except in regions impacted by open burningsources. The fact that the formation of a substantial fraction of fine PM isregulated by the thermodynamic state of the atmosphere (temperature, relativehumidity), by the presence of clouds and by the atmospheric oxidation capacityhas an important impact on air quality control policies for PM, as emissioncuts may result ineffective (or on the contrary be amplified) because ofconcurrent changes in atmospheric chemistry or in the climate system.

The way climate change affects theregional accumulation of aerosols and the resulting air quality and itsregulation in Europe is one of the main scientific research theme of theintegrated project PEGASOS (Pan-European Gas-AeroSOls-climate interaction Study).During summer 2012, an intensive field campaign was held in the Po Valley,Italy, aiming to characterize the atmospheric processes governing thephotochemistry and secondary aerosol formation. Aerosol and trace gasmeasurements were carried out at a network of stations, as well using a mobilevan and a heavily instrumented Zeppelin airship. The aerosol formation fromgas-to-particle reactions were shown to depend strongly on the thermodynamicstate of the atmosphere in the first hundreds meters of the lower troposphere. Theoverall findings suggest multiple feedbacks from climate stressors (e.g., precipitationamount, soil moisture, surface heat fluxes) on ambient PM concentrations in atemperate climate environment evolving towards subtropical conditions.

S2.2 - WILDFIRE EMISSIONS AND THEIR INTERACTION WITH URBAN AND RURAL POLLUTION: DATA AND SIMULATIONS

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In recent years NASA has conducted a series ofairborne campaigns (e. g. SEAC4RS*, ARCTAS, INTEX-A/B) over North America usingan instrumented DC-8 aircraft equipped to measure a very large number ofgaseous and aerosol constituents including several unique tracers. In these campaigns wild fires wereextensively sampled near source as well as downwind after aging. The data provided detailed information on thecomposition and chemistry of fire emissions under a variety of atmosphericconditions as well as their interactions with rural and urban air pollution. Major fires studied including the CaliforniaRim fire in 2013 (SEAC4RS), the 2008 California wildfires (ARCTAS), and the Alaskanfires downwind over eastern US (INTEX-A). Although some fire plumes contained virtually no O3enhancement, others showed significant ozone formation. Over Los Angeles, the highest O3mixing ratios were observed in fire influenced urban air masses. Attempts to simulate these interactions usingstate of the art models were only minimally successful and indicated severalshortcomings in simulating fire emission influences on urban smogformation. A variety of secondaryoxidation products (e. g. O3, PAN, HCHO) were substantiallyunderestimated. We will discuss the data collected in fire influenced airmasses and their potential air quality implications

*SEAC4RS: Studies of Emissions andAtmospheric Composition, Clouds and Climate; ARCTAS: Arctic Research of theComposition of the Troposphere from Aircraft and Satellites; INTEX-A/B:Intercontinental Chemical Transport Experiment-A/B

S2.3 - MEASUREMENTS OF BLACK CARBON PARTICLE MASS CONCENTRATION AND PARTICLE NUMBER SIZE DISTRIBUTION ON A LARGE HIGH ALTITUDE CITY OVER THE ANDEAN MOUNTAINS AND ITS POSSIBLE TRANSPORT TO THE LOWER FREE TROPOSPHERE

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Results from an intensivefield campaign carried out between September and December of 2012 at the citiesof El Alto (16°30’36.09”S; 68°11’55.31”W; 4040 masl) and La Paz (16°30’13.83”S; 68° 7’45.56”W; 3580 m asl), Bolivia are presented here. Particle number sizedistribution and the mass concentration of equivalent black carbon have been measuredusing a Mobility Particle Size Spectrometer (TROPOS-type SMPS) and a Multi AngleAbsorption Photometer (MAAP), respectively. In addition, meteorologicalparameters as well as the CO concentration were collected on both locations. Inthe case of La Paz, measurements were carried out very close to a main streetat the center of the city whereas in El Alto the instruments were set up atmore than 600 m from streets within the airport representing the urbanbackground. These two cities form the largest urban area in the region withabout 1.6 million inhabitants. Data obtained with a lidar system operating atthe Laboratory for Atmospheric Physics at the southern part of La Paz as wellas measurements of particle size distribution carried out at Mount Chacaltaya(5240 m asl) suggest that the planetary boundary layer dynamics over theAltiplano may play a significant role in the transport of traffic-related particulatematter into the Andean lower free troposphere.

S2.4 - AEROSOL OPTICAL PROPERTIES AT CAPE POINT GAW STATION, SOUTH AFRICA: A CONFLUENCE OF MARINE AND CONTINENTAL ENVIRONMENTS

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The IPCC (2007) has highlighted the scientific challenges associated with the direct and indirect effects of atmospheric aerosol behaviour. Because aerosol properties vary on relatively short temporal and spatial scales it is necessary for aerosol measurements to be made on the regional-scale. The Cape Point (CPT) Global Atmosphere Watch (GAW) station, where atmospheric aerosol optical properties have been measured since 2006, is ideally situated to elucidate marine (i.e. baseline), continental and urban influences due to variations in the prevailing air masses.Six years (2006 – 2011) of CPT aerosol data evaluated, demonstrate the complexity of the air masses found at CPT. Specific features in the annual cycles of the aerosol absorption (sap) and scattering (ssp) coefficients are discussed, along with the diurnality and seasonality of aerosol intensive properties (e.g., scattering Ångström exponent and single scattering albedo). For the years under discussion the CPT aerosols displayed a mean ± std of 0.98 ± 2.90 Mm-1 for sap and 20.36 ± 16.00 Mm-1 for ssp respectively. The complexity within the origins of the different fetch regions sampled is further highlighted by the wide range in values observed for the single scattering albedo (0.72 – 0.99) and Angström exponents (0.50 – 2.75). The low Ångström exponents occurring through much of the year indicate that CPT, a coastal site, is strongly impacted by large sea-salt particles. Ancillary data such as 222Rn and carbon monoxide (CO) suggest that CPT is occasionally influenced by incursions of urban, anthropogenic and biomass burning aerosol, most notably during Austral summer months. During these episodes the aerosol properties are significantly different than those observed during clean marine conditions. Inter-annual differences in the aerosol optical properties indicated a weak decreasing trend in most of the aerosol optical properties from 2006 up until present. Further investigation suggests a possible shift in the frequency of certain wind regimes at Cape Point, rather than a decrease in the aerosol producing sources.

S2.5 - ORGANIC NITROGEN FORMATION IN THE ATMOSPHERE AND DEPOSITION TO THE OCEAN

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Atmospheric deposition of reactive nitrogen (N) species from airpollutants is a significant source of exogenous nitrogen in marine ecosystems.Here we use an atmospheric chemical transport model to investigate the supplyof soluble organic nitrogen (ON) from anthropogenic sources to the ocean.Comparisons of modeled deposition with observations at coastal and marinelocations show good overall agreement for inorganic nitrogen and total solublenitrogen. However, the conventional modeling approach results in a significantunderestimate of the soluble ON deposition if the model only includes theprimary soluble ON and the secondary oxidized ON in gases and aerosols. Ourmodel results suggest that including the secondary reduced ON in aerosols as asource of soluble ON contributes to an improved prediction of the depositionrates. The model results show a clear distinction in the vertical distributionof soluble ON in aerosols between different processes from the primary sourcesand the secondary formation. The model results (excluding the biomass burningand natural emission changes) suggest an increase in soluble ON outflow fromatmospheric pollution, in particular from East Asia, to the oceans in thetwentieth century. These results highlight the necessity of improving theprocess-based quantitative understanding of the chemical reactions of inorganicnitrogen species with organics in aerosol and cloud water.

S2.6 - OBSERVATIONAL CONSTRAINTS ON TERPENE OXIDATION WITH AND WITHOUT ANTHROPOGENIC INFLUENCE IN THE AMAZON USING SPECIATED MEASUREMENTS FROM SV-TAG

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Biogenic volatile organic compounds (BVOCs) from the Amazon forest represent the largest regional source of organic carbon emissions to the atmosphere. These BVOC emissions dominantly consist of volatile and semi-volatile terpenoid compounds that undergo chemical transformations in the atmosphere to form oxygenated condensable gases and secondary organic aerosol (SOA). However, the oxidation pathways of these compounds are still not well understood, and are expected to differ significantly between“pristine” conditions, as is common in Amazonia, and polluted conditions caused by emissions from growing cities. As the region experiences rapid changes in land use and development, anthropogenic perturbations to the natural atmospheric processes in Amazonia increase. Our focus is to elucidate how anthropogenic emissions influence BVOC chemistry and BSOA formation through speciated measurements of their oxidation products. We have deployed the Semi-Volatile Thermal desorption Aerosol Gas Chromatograph (SV-TAG) at the rural T3 site located Southwest of the urban center of Manaus, Brazil as part of the Green ocean Amazon (GoAmazon) 2014 field campaign to measure hourly concentrations of semi-volatile BVOCs and their oxidation products during the wet season. Primary BVOC emissions measured by the SV-TAG include sesquiterpenes and diterpenes,which have rarely been speciated with high time-resolution and likely play a major role in the regional oxidant budget and SOA formation due to their high aerosol yields and high reactivity with ozone, relative to more commonly measured BVOCs (i.e. monoterpenes). We explore relative concentrations of sesquiterpenes and monoterpenes and their roles as precursors to SOA formation by combining SV-TAG measurements with those from an additional suite of VOC and particle measurements deployed in the Amazon. We investigate the influence of anthropogenic emissions on the photochemical transformation of these BVOCs by speciation oftheir oxidation products. Our measurements include tracers that can be attributed to the background chemistry of the region as well as those uniquely present when there is influence from the Manaus urban pollution plume at the T3 site. We also report the first ever hourly observations of the gas-particle partitioning of these terpene oxidation products and discuss their implications for photochemical transformation and SOA formation in the region.

S2.7 - NON-REFRACTORY SUBMICRON AEROSOL COMPOSITION BEFORE AND AFTER MANAUS AS OBSERVED DURING GOAMAZON2014-5

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The Amazon Basin, during the wet season, has one of the lowest aerosol concentrations worldwide, with air masses covering thousands of kilometers of pristine forest with negligible human impact. The atmosphere in such regions is strongly coupled with the biosphere through primary biological aerosols, biogenic salts and secondary aerosols from oxidation of biogenic VOCs. The natural environment is strongly modified nearby urbanized areas, in particular Manaus, a city of nearly two million people. The urban pollution plume has high concentrations of oxides of nitrogen and sulfur, carbon monoxide, particle concentrations, and soot, among other pollutants, strongly contrasting with the clean air masses reaching the city. Such unique location provides the ideal laboratory to study the isolated urban emission, as well the pristine environment by perturbing it in a relatively known fashion. The GoAmazon experiment was designed with these questions in mind, combining remote sensing, in situ and airborne measurements. This manuscript describes the measurements currently taking place upwind of Manaus, at the T0 site (the Amazonian Tall Tower Observatory, ATTO site) and at the T2site, near Manaus, frequently impacted by relatively fresh emissions from the city. This presentation focus on aerosol chemical speciation and size distribution from 15 February up to 13March 2014 at T0 site and 11-21 March2014 at T2 site. Initial results show comparable non-refractory submicron aerosol concentrations between the sites (0.59 µgm-3 and0.41 µgm-3 for T0 and T2, respectively), however, with large differences in the aerosol size distribution. At the T0 site, mean aerosol number concentration was 316 cm-3, with a mean geometric diameter of 127 nm. At T2 site, number diameter was over 5000 cm-3 with a mean geometric diameter of 45nm. Preliminary O:C ratio during the studied period was 1.1 and 0.6 at T0 andT2, respectively, indicating the well-processed nature of organic aerosols at T0site during the studied period. Such measurements will carry on throughout GoAmazon 2014/5, providing a unique dataset to understand the aerosol life cycle and the impact of urban emission in the heart of the Amazon Forest.

S2.8 - MAPPING OF BIOGENIC AND ABIOGENIC METHANE FROM SPACE USING GOSAT AND ACE

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The importance of Methane as an anthropogenic Green House Gas (GHG) iswell recognised in the scientific community, and is second only to CarbonDioxide in terms of influence on the Earth's radiativebudget (Parker., et al, 2011) suggesting that the ability to apportion the source of the methane(whether it is biogenic, abiogenic or thermogenic) has never been moreimportant. It has been proposed (Etiope 2009) that it is possible todistinguish between a biogenic methane source (e.g. bacteria fermentation) andan abiogenic source (complex hydrocarbons) via the retrieval of the abundancesof methane isotopologues (12CH4 and 13CH4) from the gassources. Using ultra fine spectroscopy (<0.01nm spectral resolution) fromFourier Transform Spectrometers (FTS) based on ACE and GOSAT we are developinga retrieval scheme to map global emissions of abiogenic and biogenic methane,and provide insight into how these variations in methane drive atmosphericchemistry, focusing on the lower levels of the atmosphere.

Using HiTran2012 simulations, we show that it is possible to distinguishbetween methane isotopologues using the FTS based instruments on ACE and GOSAT,and retrieve the abundances in the Short Wave Infra-red (SWIR) 1.65µm, 2.3µm, 3.3um, 3.7um and Thermal IR, 7.8µm wavebands.Initially we use the spectral line database HiTran2012 to determine the mostappropriate spectral waveband to retrieve methane isotopologues to minimise watervapour, CO2 and NO2. We then moved onto the application of the atmosphericsimulation tool MODTRAN, to determine the barriers in retrieving methaneisotopologues in both the ACE (limb profile) and GOSAT (nadir measurements)satellites, and investigate the effects of clouds, aerosols, surfacereflectance and turbulence within the Planetary Boundary Layer (PBL) on theretrieval of methane isotopologues. The effects of the instruments themselveson the retrieval are key in this process, and are investigated in some detailusing optical modeling tools.

Finally we plan to apply this knowledge to retrieve methane isotopologueabundances from data generated by ACE and GOSAT, therefore allowing us toperform validation of the MODTRAN simulations, and allowing us to draw informedconclusions on the global distribution of biogenic and abiogenic methane.

S2.9 - TRACKING ANTHROPOGENIC INFLUENCE ON ISOPRENE CHEMISTRY OVER AMAZONIA

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Isoprene is the dominant biogenic non-methane hydrocarbon in the atmosphere. Photooxidation of isoprene has a large influence on the oxidation capacity of the atmosphere and the formation of secondary organic aerosol (SOA). Many globally-important source regions of isoprene, including Amazonia, are experiencing rapid land-use change and urbanization.The goal of this study is to assess the modifications by anthropogenic pollution of natural isoprene chemistry over Amazonia and their potential climate impact. As a part of the GoAmazon-2014 Intensive Campaign, isoprene and its oxidation products were measured using a proton-transfer-reaction time-of-flight mass spectrometer (PTR-TOF-MS) in the wet season at a research site 60 km west of Manaus, the fetch of which oscillated between the extremes of a pristine atmosphere and the interactions of heavy pollution from Manaus with the natural environment. Photooxidation of isoprene leads to chemically different oxidation products depending on the fate of isoprene-derived peroxyl radicals (ISOPOO), but different oxidation products can produce the same ions in PTR-MS analysis due to similarity in their chemical structures. A cold trap was deployed in front of the PTR-TOF-MS for separation and differential classification of isoprene oxidation products. For example, isoprene-derived hydroperoxides and methyl vinyl ketone/methacrolein,which are major oxidation products of the HO2 pathway and NO pathway of ISOPOO reaction, respectively, were separately measured. Using measurements of these and other oxidation products, the contribution of different pathways to the fate of ISOPOO is constrained. The fates under pristine and polluted scenarios are compared and the implication for SOA formation is discussed. Results of this work are important for evaluating and predicting the atmospheric impact of isoprene chemistry.

S2.10 - NIGHT TIME FORMATION OF SECONDARY ORGANIC AEROSOL: NEW EVIDENCE FOR A STRONG SOURCE FROM NO3 OXIDATION

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In the atmosphere night time removal of organicspecies is initiated to a large extent by reaction with the nitrate radical (NO3)which is formed in the presence of nitrogen dioxide (NO2) and ozone.While the formation of NO3 and its reactions with volatile organiccompounds (VOCs) are reasonably well understood, little is known about theatmospheric fate of the reaction products. Organic nitrates (RONO2)are formed in the course of the oxidation process and partition between gas andparticulate phase. Based on particle phasemeasurements performed at Cabauw, a suburban site in the Netherlands, we show thatorganic nitrates contribute substantially to particulate nitrate and organicmass. Using a chemistry transport model (CTM) that includes secondary organicaerosol (SOA) formation from NO3 oxidation, we infer the SOA massformed from this night time oxidation process. Comparisons of experimental andmodelled concentration and diurnal pattern of organic nitrate indicate that themeasured particulate organic nitrates are formed by NO3 oxidation. Organicnitrates represent 34% to 44% of measured submicron aerosol nitrate. Theobserved particulate organic nitrates could represent a substantial fraction ofthe total annual source of anthropogenically controlled secondary organicaerosol that is estimated to be ~100 Tg/yr. Furthermore our findings indicatethat a substantial potential for aerosol reduction exists through the controlof anthropogenic NOx emissions.

S2.11 - THE RELATIVE IMPORTANCE OF WATER SOLUBLE ORGANIC NITROGEN IN TROPICAL ATMOSPHERIC DEPOSITION. POSSIBLE MECHANISMS AND IMPLICATIONS TO REGIONAL TROPICAL ECOSYSTEMS ATMOSPHERIC NITROGEN SOURCES.

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Water solubleorganic nitrogen (WSON) concentrations from atmospheric deposition have beenassociated with the oxidation of compounds derived from both anthropogenic(fossil fuel and biomass burning) and biogenic (vegetation aerosols and VOCemissions) sources. Recent studies from remote areas have found a significantlylarge contribution of WSON relative to total nitrogen (TN), in some cases beinglarger than 90%. We measured WSON, water soluble inorganic nitrogen (WSIN), cationsand anions from atmospheric deposition (wet and dry) from several areas ofVenezuela (remote continental, remote oceanic, rural, suburban and urban). We foundin both wet and dry deposition that WSON relative contribution to TN was largerthan 50%. We also found in atmospheric aerosols positive statisticallysignificant correlations between WSON and water soluble inorganic nitrogen(WSIN), non-sea-salt sulfate (nss-SO4=), Ca+2and K+ which implies that both fossil fuel and biomass burning are significantWSON sources in aerosols. On the other hand, we found that WSON from wet depositioncorrelates positively only with WSIN and SO4= and negativelywith precipitation volume. For our remoteoceanic site, we found also larger concentration values of WSON, WSIN and SO4=in fine aerosols during the rainy season in comparison to the dry season. Our resultssuggest that the most important source of WSON in the ocean is related to aged airmasses that have larger N sources during the rainy season. We provide a comparativeanalysis of our WSON results and other previous studies in tropical Latin Americaand calculate the relative importance of this nitrogen source in this latitude.

S2.12 HUMANS VS. NATURE AS DRIVERS OF TROPOSPHERIC GASES AND AEROSOL CHANGED OVER THE LAST DECADES

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SESSION 3 - INTERACTIONS BETWEEN AEROSOLS, CLOUDS AND PRECIPITATION

S3.1 - AEROSOL EFFECTS ON SUBTROPICAL MARINE STRATOCUMULUS CLOUD ALBEDO IN CLIMATE MODELS AND SATELLITE OBSERVATIONS

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Cloud brightening due to increased aerosol loading is one of many ways in which aerosols can affect clouds, radiation and climate. By studying the relation between total albedo and cloud fraction on regional scale in climate models and satellite observations, we can estimate the cloud albedo in a regional cloud field, and thereby investigate its sensitivity to varying aerosol conditions. Our results indicate that climate models may have a too strong cloud-albedo effect, as compared to satellite observations.

We focus on five subtropical marine stratocumulus cloud regions, finding an improved representation of the shortwave radiative properties of these clouds in current-generation models (CMIP5) compared to previous generation models (CMIP3).

In the CMIP5 models, increased aerosol loading is found to be the likely cause of an increase in cloud albedo over time. However there are no observations to verify the radiative effect of such a scene brightening from pre-industrial to present day.

The CMIP5 models also consistently display a pattern of higher cloud albedo at higher aerosol loading, in agreement with the theoretical effect of cloud brightening due to higher cloud condensation nuclei concentration. Satellite observations (from CERES and MODIS) on the other hand show no indication of such a relationship, suggesting that the cloud-albedo effect does not have a dominating impact on the radiative signature of these cloud scenes on a climatologically relevant scale. While some of the studied regions show no systematic variation at all in albedo with aerosol optical depth, others display a reversed relationship - cloud scenes with a high aerosol optical depth have lower albedo. A cancellation, or a reversed sign of the expected cloud-albedo effect would considerably alter the estimated magnitude of total anthropogenic forcing on climate.

S3.2 - CENTRAL AMERICAN BIOMASS BURNING SMOKE CAN INCREASE TORNADO SEVERITY IN THE US

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Violent tornadoes in the Southeast and Central US during spring are often accompanied by smoke from biomass burning in Central America. We analyzed the effect of smoke on a historic severe weather outbreak that occurred 27 April 2011 using a coupled aerosol, chemistry and weather model (WRF-Chem) and a suite of satellite and ground-based observations. Smoke from Central American biomass burning was present in the boundary layer and lower free troposphere before and during the storm outbreak. Simulations show that adding smoke to the environment already conducive to severe thunderstorm development increases the likelihood of significant tornado occurrence, which is assessed by analyzing effects of smoke on meteorological conditions (tornado parameters) used by prediction centers to forecast tornado occurrence and severity. Further analysis shows that the mechanism responsible for the parameter intensification has two parts. First, through indirect effects, stratiform clouds present during and before the outbreak became optically thicker, which reduced the amount of solar radiation reaching the ground and produced more stable conditions and higher low-level shear in the mixed layer. Second, through semi-direct effects, soot contained in the smoke heated the aerosol layer stabilizing the atmosphere and enhancing cloud cover below the aerosol layer, producing a more stable boundary layer and conditions leading to higher probability of violent tornadoes. This mechanism was assessed for other outbreaks occurring over multiple years showing that similar effects were often found, and the conditions for which the smoke intensifies these events will be summarized. The inclusion of aerosol-cloud-radiation interactions in weather forecasts may help improve the predictability of these extreme events, which can improve the timeliness and accuracy of severe weather alerts within future operational forecast systems.

S3.3 - IMPACT OF LONG-RANGE TRANSPORTED AFRICAN DUST EVENTS ON CLOUD CHEMISTRY AT A CARIBBEAN TROPICAL MONTANE CLOUD FOREST

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As part of the PuertoRico African Dust and Clouds Study (PRADACS), we studied the impact of long-range transported African Dust (LRTAD)on cloud composition and properties at the Caribbean tropical montanecloud forest (TMCF) of Pico del Este (PE). Here we present results from measurementsperformed from 2010-2012. The use of HYSPLIT backward trajectories, opticaldata of scattering and absorption coefficients, and enrichment factor analysisallowed sampled air masses to be classified as marine, dust, or dust with anthropogenicparticles. Measurements of pH and conductivity showed higher values in thepresence of dust and for larger cloud droplets (size cut of 17 µm at 50%efficiency), suggesting a higher content of dust in this fraction. Analyses ofthe cloud water samples using ion chromatography, inductively coupled plasmaand aerosol time-of-flight mass spectrometer (ATOFMS) suggest, specifically forthe summer samples, the influence of African dust by the presence of nss-Ca2+,Fe, Ti, Al, Si and when comparing ratios of Ca, K, and Mg to Na with seawaterratios reported in the literature. Sea salt was always present in thebackground composition. The influence of anthropogenic pollution was small asseen from the ATOFMS measurements of elemental carbon particles, a tracer forcombustion processes on some dust events. Additional results on the organic fraction and on the chemistry of peroxides,formaldehyde and S(IV) together with cloud microphysical properties such as cloudfrequency, liquid water content and cloud condensation nuclei concentrationswill be presented at the meeting. Results so far suggest that LRTAD events havean impact on the chemical and physical properties of aerosols and clouds at PEand that therefore can have an impact on aerosol-cloud-precipitationinteractions.

S3.4 - HYGROSCOPIC BEHAVIOR AND CCN ACTIVITY OF BIOMASS BURNING AEROSOLS IN BRAZIL: PRELIMINARY RESULTS

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The biomass burning activity constitutes an important source of atmospheric aerosols, as well as trace gases. In South America during the dry season, aerosols originated from biomass burning are typically transported long distances from its sources before being removed and represent a significant amount of the aerosol budget on a continental scale. The uncertainties in the magnitude of the impacts on the hydrological cycle, the radiation budget and the biogeochemical cycles on a continental scale are still significant. The capacity of this aerosol population to act as cloud condensation nuclei (CCN) contributes significantly to such uncertainties. The present work aims to assess the uncertainties of the CCN activity of the biomass-burning aerosol using semi-empirical modeling tools. A weighted average specific hygroscopic parameter k=0.07 was obtained for the biomass burning aerosol population using DMPS and H-TDMA data available in the literature for the region, considering the relative abundance of the externally mixed nearly hydrophobic and nearly hygroscopic fractions. The obtained CCN concentrations from k- Köhler theory were consistent with the average CCN counter data. The specific hygroscopic parameter can be linked to the explicit calculation of aerosol activation and to some broadly used physical-based parameterizations, such as the Abdul-Razzak-Ghan (ARG) scheme. However, some of the assumptions considered in the formulation of such parameterizations might not be valid anymore for aerosol populations with low hygroscopicity values. This aspect is further explored in a modeling of the early stages of cloud development using a cloud parcel model for a typical condition in the dry season and the transition period in Amazonia. Explicit calculation and ARG scheme results are presented and discussed. This work provides a preliminary estimation of the uncertainty arising from the use of a physical based parameterization on global and regional models in cases where the influence of biomass burning aerosols is likely to be important.

S3.5 - MOLECULAR COMPOSITION OF ORGANIC COMPOUNDS IN ATMOSPHERIC PARTICLES AND CLOUD WATER DURING SOAS: INSIGHTS INTO AQUEOUS PROCESSING

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Atmospheric particles play a large role in the climate system by forming cloud droplets and absorbing or scattering solar radiation. Organic species comprise a significant mass fraction of submicron atmospheric particles with considerable contribution from secondary organic aerosol, a significant fraction of which are formed from the oxidation of biogenic volatile organic compounds. Aqueous-phase reactions in particles and cloud droplets are suggested to increase secondary organic aerosol mass and change the chemical composition of the atmospheric particles. In this study, atmospheric particles and cloud water were collected on board a research aircraft during the Southeast Oxidants and Aerosol Study (SOAS) over Alabama in June 2013. We have utilized nanospray desorption electrospray ionization (nano-DESI) and direct electrospray ionization (ESI)

coupled with high resolution mass spectrometry to probe the organic molecular composition of the particle and cloud water samples, respectively. Our results indicate several hundred unique compounds identified in the atmospheric particles. Comparison of the fractions and characteristics of CHO, CHNO, CHNOS, and CHOS-containing compounds in the particle and cloud water samples provides information about aqueous processing pathways. In particular, organosulfate compounds were ubiquitous in both the particle and cloud water samples; the formation of these compounds from organic nitrate and epoxide precursors will be discussed. These data provide insights into the processing of organic compounds in cloud droplets and improve our understanding of atmospheric organic particle budgets and climate impacts.

S3.6 - THE EFFECT OF ATMOSPHERIC PROPERTIES AND PROCESSES ON AEROSOL INDIRECT EFFECTS IN A TRADE CUMULUS REGIME

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An assumption inherent in theexpression of the Twomey effect is that the liquid water path of acloud remains constant between the clean and aerosol-perturbed cases. However, if changes in aerosol has an effect on cloud liquid water,it will alter the magnitude of the aerosol cloud-albedo changes.

In the recent CARDEX (Cloud, Aerosol,Radiative forcing, Dynamics EXperiment) field campaign conducted inMarch 2012 in the northern Indian Ocean, continuous measurements ofprecipitable water vapor (PWV) and column liquid water path (LWP) ofthe trade cumulus clouds present were made from a microwaveradiometer (MWR), concurrent with water vapor flux, cloud and aerosolvertical profiles, meteorological data, and surface and total-columnaerosol measurements. The results show a relationship betweenaerosol and cloud LWP when filtered by total-column atmospheric PWV. That is, an increase in aerosol concentration was found to correlatewith an increase in cloud LWP under dry atmospheric conditions only,a distinction which is shown to be due to enhanced variability incloud formation under high-vapor conditions.

We then use aircraft and groundobservatory measurements of aerosol, radiation, cloud, and fluxproperties to explore the atmospheric processes and dynamicalmechanisms behind the observed aerosol-LWP correlation for dryconditions. We determine that increased boundary-layer humiditylowering the cloud base is responsible for this effect.

Large-scale analysis indicates that thehigh pollution cases originate with a highly-polluted boundary layerair mass approaching the observatory from a northwesterly direction. This polluted mass also exhibited higher temperatures and humidity,the former of which may be attributable to aerosol heating of theatmosphere. The high humidity condition was observed to developrather than disperse along with the air mass. A statistical analysisindicates that the relationship between aerosol and humidity islagged; the nature of this correlation suggests a potential effect ofaerosol within this air mass enhancing the atmospheric humidity.

S3.7 - NEW PARTICLE FORMATION IN PRISTINE AMAZONIAN DEEP CONVECTIVE CLOUDS

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The total number, size, and composition of an aerosol population entrained into a cloud system can affect cloud physical features (e.g. updraft velocity or precipitation rate) while cloud properties can affect features of the aerosol population (e.g. through wet scavenging efficiency or vertical lifting). This tightly-coupled system exhibits complicated feedbacks that are hard to discern in a theoretical model without faithfully representing the detailed transport, microphysical and chemical processes. We use a new three-dimensional cloud-resolving model, CRM-ORG, to investigate new particle formation events within and downwind of pristine Amazonian deep-convective clouds. CRM-ORG accounts for the processing of inorganic and organic aerosol in a coupled, dynamic simulation.

During deep-convective events,substantial amounts of trace gases and particles are injected to the upper troposphere. Once there, these species may react to produce condensable secondary vapors capable of growing newly formed nanoparticles. Because of the extreme conditions involved (i.e. low temperatures, widely variable RH, etc),different formation and removal pathways are important for gases and particles located at high altitudes compared to those near the surface. This work attempts to quantify those relationships given our current understanding and identify the major process uncertainties involved.

To represent formation and evolution of organic aerosol we rely on the Volatility Basis Set approach (Donahue et al., 2006). CRM-ORG incorporates three lumped species, describing the oxidation products of isoprene, monoterpene and sesquiterpenes compounds across a spectrum of volatility. The mass transfer of these species to/from particles and cloud drops is treated dynamically. The sulfate and organic aerosol species are represented with three internally-mixed modes (one each in the nucleation, Aitken and accumulation size ranges). The model accounts for particle nucleation via traditional pathways (i.e. binary sulfuric acid-water,ion-mediated) as well as less investigated pathways (i.e. homogeneous organic vapor nucleation, sulfuric acid-organic nucleation [Metzger et al., 2013]). We also probe the sensitivity of the model's results to both the formulation of the nucleation mechanism and the volatility of condensable organic vapors.

Metger, A. et al. (2013) PNAS, 107, 15, 6646-6651.

Donahue, N.M. et al. (2006) Environ. Sci. Technol. 40, 2635-2643.

SESSION 4 - ATMOSPHERIC CHEMISTRY AND URBANIZATION: FROM LOCAL TO THE GLOBAL SCALES

S4.1 - LEVELS AND COMPOSITION OF PM2.5 IN THE METROPOLITAN AREA OF BUENOS AIRES: LOCAL AND REGIONAL CONTRIBUTIONS IN INLAND VERSUS COASTAL SITES

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To gain a better understanding of the local and regional influences in the chemical aerosol profiles of the metropolitan area of Buenos Aires (MABA), levels of metals, metalloids, ions, and black carbon (BC) were determined in PM2.5 samples collected along a 3-point

transect. The sampling sites, representing differentiated conditions, were located: (1) on the coast of the La Plata river, (2) at a park in the geographical center of Buenos Aires city, and (3) in the peri-urban area. The distance between sites 1 and 3 is ~26km and although it may seem surprising, this is the first air pollution assessment for the MABA that considers such an extended area. A number of 400 24-hour samples were collected over 18 months on Teflon filters using Airmetrics samplers. This study presents our findings regarding mass, cations (K+, Na+, NH4+) and BC concentrations. Regional contributions were identified using the potential source contribution (PSCF) which combines the statistical distribution of the determined concentration levels with the origin of air masses reaching the sampling site. Our results show that the levels of PM2.5 are influenced by both, local urban activities and regional transport, and they increase from the coast inland. The BC fraction is generally well correlated with PM2.5 concentration, exhibiting a relatively flat maximum in the urban area (site 2). However, the BC levels at site 3 are practically very similar to those at site 2, indicating the presence of an urban pollution plume covering most of the MABA. Continental and oceanic influences in the NE-SW direction are differentiated regional contributions. Oceanic presence is reflected in relatively low concentrations of PM2.5, BC and K+ and relatively high levels of Na+ while the opposite occurs under continental influence. Relatively high levels of K+ are good markers of plumes arising from biomass burning that has reached the MABA. Constant NH4 + levels allow hypothesizing that secondary aerosol may be evenly distributed in the MABA.

S4.2 - ASSIMILATION OF SURFACE PM2.5 OBSERVATIONS FROM MORE THAN 300 STATIONS INTO AN AIR QUALITY MODEL OVER CHINA

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In order to give an overall view of air pollution levels of China during the extremely severe polluted episodes in January 2013, the surface PM2.5 observations from more than 300 stations were firstly assimilated into a 3-dimensional air quality model to estimate the distribution of PM2.5 concentrations over China. The data assimilation system was established based on ensemble Kalman filter (EnKF) and a Nested Air Quality Prediction Modeling System (NAQPMS). In order to obtain flow-dependent error covariance for the simulated PM2.5, 50 ensemble runs of NAQPMS were performed and emissions of NOx, VOCs, SO2, NH3, PM2.5,BC and OC as key uncertainty sources of PM2.5 modeling were perturbed. The spurious correlation impacts from remote observations, induced by the finite ensemble size of EnKF, were reduced through localization technique. Off-line reanalysis were conducted during January 2013, and surface PM2.5 observations were sequentially hourly assimilated into the airquality model. A reanalysis dataset of surface PM2.5 concentrations over whole China were obtained with 1-h temporal and 45km spatial resolution.Detailed validation for the reanalysis datasets were conducted by using independent observations from another observation network of Chinese Academy of Sciences and cross-validation method. The reanalysis data can reproduce the spatial distribution feature of observed PM2.5. The uncertainties of the dataset over high PM2.5 concentration areas were estimated to bewithin 20% and significantly lower than the uncertainty of the simulated data. Overall, the reanalysis PM2.5 data was validated as a high quality dataset for evaluation of PM2.5 pollution over China. It can provide valuable information over the areas without monitoring stations.

Keyword: PM2.5 observations, data assimilation, China

S4.3 - AFRICAN ANTHROPOGENIC COMBUSTION EMISSIONS: IMPACT ON ATMOTSPHERIC COMPOISTION AND HEALTH IN 2005 AND 2030

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Fossil fuel (traffic, industries …) and biofuel (domestic fires) emissions of gases and particles in Africa are expected to significantly increase in the near future, particularly due to rapid growth of African cities and megacities.

In this study, we will present the most recent developments of African combustion emission inventories, including African specificities. Indeed, a regional fossil fuel and biofuel inventory for gases and particulates described in Liousse et al. (2014) has been developed for Africa at a resolution of 0.25° x 0.25° for the years 2005 and 2030. For 2005, the original database of Junker and Liousse (2008) was used after modification for updated regional fuel consumption (new activity sector and new emitter category) and emission factors including new measurements. Two prospective inventories for 2030 are derived based on Prospective Outlook on Long-term Energy Systems (POLES) model (Criqui, 2001). The first is a reference scenario (2030ref) with no emission controls and the second is for a “clean” scenario (2030ccc) including Kyoto policy. A ccc* scenario has been also constructed from african specific emission control. This inventory predicts very large increases of BC, OC, CO, NOx, SO2 and NMHC emissions in 2030, if no emission regulations are implemented. For example, African anthropogenic combustion emissions could contribute to 50% of the organic carbon global anthropogenic emissions in 2030. The estimated trends in African emissions are consistent with emissions provided by global inventories, but they display a larger range of values.

These inventories have been introduced in RegCM4 model (Solmon et al., 2006). In this paper we will focus on aerosol modelled concentrations (BC, OC, PM2.5) in 2005 and in 2030. Spatial distribution of aerosol concentrations will be presented with a zoom on a few urban and rural sites. Finally mortality rates (respiratory, cardiovascular ..) caused by anthropogenic PM2.5 increase from 2005 to 2030 have been calculated following Lelieveld et al. (2013). Such results will be shown for each scenarios.

To conclude, this paper will discuss the effectiveness of scenarios to reduce emissions, aerosol concentrations and mortality rates.

S4.4 - USING CHEMICAL RATIOS TO DISENTANGLE SOURCES OF PARTICULATE MATTER POLLUTION: IMPLICATIONS FOR POPULATION EXPOSURE AND HUMAN MORTALITY

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Recent studies on correlations between particulate matter (PM) and mortality point out that there is a gain in the life expectancy of 0.35-0.6 years per 10µg/m3decline in annual PM concentrations. These studies emphasize that further decrease in PM levels would imply additional gains in life expectancy. However,it is difficult to revise the national ambient air quality standards to reduce PM unless the relative contributions of natural and anthropogenic sources contributing to abundances of PM are identified. Previous studies on sources of PM have mainly been based on direct measurements of PM and aerosol optical depth (AOD). These measurements are spatially and temporally limited and most of them are restricted to urban regions which result in large uncertainties in the estimation of PM sources. On the other hand, gas phase species such as carbonmonoxide (CO) have relatively better spatio-temporal coverage and can be used as tracers for PM. Here, a framework which includes CO and PM measurements is introduced to disentangle and update the natural, anthropogenic, and biomass burning sources of PM across Contiguous United States (CONUS). This combines ground, satellite observations and outputs from an online Weather Research and Forecasting Model coupled with Chemistry (WRF-Chem). A tagged tracer approach is implemented for CO in WRF-Chem to identify contributions from individual sectors and geographical regimes. In order to determine optimized CO that matches with observations, an inversion approach using CO tracers from WRF-Chem in combination with total CO observations from US Environmental Protection Agency Air Quality System (EPA AQS) high resolution monitoring sites and Measurements of Pollution in the Troposphere (MOPITT) V6 is developed. To the best of our knowledge, this is the first comprehensive development of CO state level emissions specifically based on both EPA 'high resolution sites' and MOPITT V6 products. We combine chemical ratios of optimized CO and PM in a joint inversion to update the major contributions of PM from anthropogenic, natural (e.g.dust) and biomass burning sources. Finally, we will explore thresholds for reducing annual mortality counts and improving policy related strategies in US using state level emissions of PM sources.

S4.5 - PM CHEMICAL CHARACTERIZATION IN TIJUANA (MÉXICO) DURING THE CAL-MEX CAMPAIGN

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The Cal-Mex campaign was carried out in the city of Tijuana (Mexico) from May 15 to June 30, 2010 in order to characterize major processes (emission, transport and transformation) of particulate matter (PM)and precursor gases occurring along the California-Mexico border region. During the Campaign, 24-hour PM samples were collected using Minivol Portable Air Samplers (Airmetrics, Eugene Oregon, US) in two different sites within the urban area. One of the sites (PQM) was situated in a residential area, close to relatively large avenues. The other site (CEC) was a receptor site located on top of a hill, downwind from urban emissions and with few other PM sources nearby. Samples were analyzed for trace elements and Pb isotopic composition using mass spectrometry, and for organic and total carbon using thermo-optical methods. A comparative analysis of the results is presented to better understand the main PM sources impacting each site.

S4.6 - AEROSOL PARTICLES OPTICAL DEPTH RETRIEVALS AT SAO PAULO CITY AND EFFECT ON DOWNWARD SOLAR IRRADIANCE AT THE SURFACE

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As part of NUANCE-SPS (Narrowing the Uncertaintieson Aerosol and Climate Changes in São Paulo State) Project, aerosol opticaldepth at Sao Paulo city is being continuously retrieved using a Multi-FilterRotating Shadowband Radiometer measurements performed at 413, 673, 870 and 1038nm narrow band channels. Simultaneously, collocated solar irradiance atdifferent spectral bands are continuously monitored, from global total (280 to3000 nm) with a CM21 pyranometer from Kipp & Zonen, PAR (photosyntheticallyactive radiation, from 400 to 700 nm) with SKE 510 sensor from Skye, a biometermodel 501 from Solar Light (280 to 320 nm) and a spectroradiometer from EKOInstruments, measuring spectral irradiance from 347 to 1057 nm, with 3 nmresolution. The integration of this set of measurements meant to advancecurrent understanding on the radiative impacts of the particulate matter overthe city atmosphere column. Results from those measurements and modelingsimulations with a radiative transfer code (LibRadtran) will be compared in theframework of closure experiments. Furthermore, clearness index on cloudy andclear days will be estimated and the frequency of occurrence of each conditionwill be also discussed.

S4.7 - ENERGY-RELATED EMISSION PROJECTIONS: THE NEXUS OF ECONOMY, INFRASTRUCTURE, AND TECHNOLOGY

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Future emissions of air pollutants depend on energy demand in a few major sectors, including transportation and residential uses. We present emission scenarios for these two sectors, which are important emitters of particulate matter that affects health and climate. We use a hybrid approach in which fuel use in each sector of a global macroeconomic scenario is downscaled to emissions by representing infrastructure technology choice. Transportation emissions are projected with a global vehicle fleet model, within which a model of the freight-handling system in the United States is nested. This model shows how transportation emissions respond to changes in vehicle standards, road infrastructure,rail infrastructure, and urban form. For residential emissions, we focus on countries where solid fuel provides most of the energy, identifying mitigation strategies that rely on electrification, fuel availability, and the need to purchase fuel. We propose that the future of emission projections lies in broad but “good-enough” models that can represent the response of technology and emissions to policy, economy, and the surrounding environment.

S4.8 - RESULTS FROM THE FIRST TWO YEARS OF AEROSOL AND GAS OBSERVATIONS AT THE WORLD”S HIGHEST GAW STATION: CHACALTAYA, BOLIVIA

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In December 2011, a new high altitude GAW station in the Andes began its operation. A consortium of institutions led by the Laboratory for Atmospheric Physics (LAP) and formed by institutions from Europe and the United States set up a suite of instruments at the recently refurbished Universidad Mayor de San Andrés facilities at Chacaltaya in Bolivia. The existing infrastructure is part of the Chacaltaya Cosmic Ray Laboratory that has been functioning for more than 60 years. The Chacaltaya/GAW (CHC) station is located at 5240 m asl (16°21'1.78"S, 68° 7'53.44"W) on the westward face of Mount Chacaltaya. This peak is part of a mountain range known as the Cordillera Real in the Altiplano region. The station is located relatively close to Lake Titicaca and to the Amazon basin. The largest metropolitan area of the region, formed by the cities of La Paz and El Alto, is located approximately 17 km in a straight line from the station and is situated from 1200 to 1600 m below it. Due to this location, air masses arriving from the Altiplano, the Amazon and from the urban region are regularly sampled at Chacaltaya. Results for the first two years of measurements are presented here. Aerosol properties, size and distribution in the size range of 10-500 nm, as well as concentrations of some reactive and greenhouse gases are analyzed for the period 2012-2013. We report on background levels of aerosols in the lower free troposphere as well as events such as smoke produced by biomass burning that is transported to the Andean region. Ancillary measurements from a lidar system located at the LAP (3400 m asl) are also discussed in this context.

S4.9 - TROPOSPHERIC OZONE CLIMATOLOGY SINCE 1995 OVER EAST ASIA

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We report ozone climatology in the tropospehereover East Asia by using ozoneprofile data obtained by ozonesonde and airborne measurements (MOZAIC/IAGOS), and the recent retrieval products of the Ozone Monitoring Instrument (OMI) onboard the EOS/Aura satellite [Liu et al., 2010]. The OMI products and airborne data revealed that ozone in the lowermost troposphere enhanced over the Central and East China in June every year, associated with the enhancement of CO observed by MOPITT and hotspots observed by MODIS.This suggested that a considerable part of the enhancement could be attributed to the emissions of ozone precursors from residue burning after harvesting of winter wheat in these areas. The ozone enhancement and variability observed downstream from China show clear evidence of transboundary pollution from China to Korea and Japan. We will present seasonal variation and long-term change of ozone profiles over East Asia and discuss ozone sources and transport processes.

References

Liu, X., et al.(2010), Ozone profile retrievals from the Ozone Monitoring Instrument, Atmos. Chem. Phys., 10(5), 2521-2537.

S4.10 - IN-SITU CHARACTERIZATION OF AIR QUALITY OVER SOUTH AFRICA

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Natural and anthropogenic pollution sources in South Africa have a significant global impact. A frequently visible 'river of smoke' forms out of the complex interplay between persistent industrial and metropolitan sources and spatio-temporally variable sources, like biomass and domestic burning. The distribution and character of major air pollution sources in southern Africa plays an important role in its transport and impact over the region. This paper reports on a series of airborne campaigns between 2003 and 2007 that collected around 400 hours of in-situ data during 175 flights around southern Africa using a diverse instrument suite. In-plume and background measurements of sulfur dioxide, carbon dioxide, carbon oxide, oxides of nitrogen, volatile organic compounds and particulates were made for industrial sources in the power, petroleum, steel, aluminium, paper and cement industries as well as distributed sources like biomass burning, domestic burning and urban centers. These profiles were compared against surface measurements to evaluate its application to source apportionment. The uncertainties and caveats of aircraft based monitoring were compared against remote sensing and modelling approaches to assess its application to air quality mapping in developing countries with limited surface monitoring resources.

S4.11 - IS TROPOSPHERIC OZONE REALLY INCREASING OVER SOUTHERN AFRICA? EVIDENCE OF A PARADOX FROM SURFACE, SONDE AND AIRCRAFT OBSERVATIONS

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Two studies of trends in tropospheric ozone over thesouthern African region are reported. Bothinvestigations use a multi-variate regression model with monthly averaged data fromthe period 1990-2007. For surfacetrends, the ozone and nitrogen oxides (NOx) measurements come from fromfive air quality monitoring stations in the South Africa (SA) Highveld region eastof the Johannesburg-Pretoria megacity for which fires, industry and power plantemissions are readily visible in satellite NO2 imagery. The trends model assumed anENSO effect, annual cycle, and dependence on NOx, the key componentof ozone chemical formation. Four out ofthe five stations exhibit statistically significant sensitivity to ENSO at somepoint in the December-May period where El Niñoamplifies ozone formation and La Niñareduces ozone. However, over the 18-yr period,two stations exhibit negative ozone trends and three stations show nostatistically significant change. Thefree tropospheric (FT) ozone data are from the Irene (25S, 28E) SHADOZ stationnear Pretoria, 25 km from the Johannesburg International Airport, where MOZAICcommercial aircraft ozone profiles fill in a gap in the sonde observations from1995-1999. In thatcase ozone, from 4-11 km, in late-fall-winter (May-July) ozone showed asharp increase, of 20-25%/decade from 1990-2007. As a comparison, trends in wintertime FT ozonefrom soundings over Réunion Island, another SHADOZ station, were +40%/decadebased on data from 1992-2011. At both Ireneand Réunion, back trajectories from sonde launch times point to origins in FTozone over southern Africa, the south Atlantic, all the way to South Americaand beyond. This suggests increases in long-rangetransport of pollution. For Réunion, trajectoriesplace some ozone origins over regions affected by southern Asian emissions. Surprisingly, the season of maximum biomass-burning influences over southern Africa and Réunion, processes that we havestudied in many field campaigns, showed no trends. In summary, we have discovered a bellwether-for the growth of anthropogenic pollution in the southern hemisphere and pinpointeda narrow time of year (winter) with maximum impact on ozone over southernAfrica.

S4.12 - ORGANIC AEROSOL CONCENTRATION AND COMPOSITION OVER EUROPE: INSIGHTS FROM CHEMICAL TRANSPORT MODELING AND FACTOR ANALYSIS DATA

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A detailed three-dimensional regional chemical transport model (PMCAMx) was applied over focusing on the formation and chemical transformation of organic matter. An extensive set of Aerosol Mass Spectrometer (AMS) measurements was used to evaluate the model and, using factor analysis results, gain more insight into the sources and transformations of organic aerosol (OA). Oxygenated OA (OOA) is predicted to contribute 93% to total OA during spring, 87% during winter and 96% during autumn with the rest consisting of fresh primary OA (POA). Predicted OOA concentrations compare well with the observed OOA values for all periods with an average fractional error of 0.53 and a bias equal to -0.07 (mean error = 0.9 μg m-3, mean bias = -0.2 μg m-3). The model systematically underpredicts fresh POA in most sites during late spring and autumn (mean bias up to -0.8 μg m-3). Based on results from a source apportionment algorithm running in parallel with PMCAMx, most of the POA originates from biomass burning (fires and residential wood combustion) and therefore biomass burning OA is most likely underestimated in the emission inventory.

During the period of June-July 2012 an AMS was adapted for airborne aerosol chemical composition measurements on a Zeppelin NT airship as part of the PEGASOS project. The Zeppelin platform allowed for measurements with high spatial resolution throughout the entire planetary boundary layer (PBL). The campaign observations revealed a higher degree of organic aerosol ageing in the Po Valley than in the . Differences between the individual layers of the PBL were identified in the mass concentrations of the aerosol chemical species and the organic aerosol age. The agreement between model predictions and the airborne measurements of aerosol chemical composition at various altitudes is encouraging.

PMCAMx-Trj, a 1-D Lagrangian transport model hosting the two-dimensional volatility basis set (2D-VBS) framework for the simulation of the oxidation state of OA, was applied to simulate the chemical evolution of air parcels arriving at San Pietro Capofiume, Italy, one of the sites with extensive observations during the PEGASOS summer 2012 campaign.

S4.13 - INVESTIGATIONS OF THE FORMATION AND GROWTH OF ULTRAFINE PARTICLES IN A COASTAL URBAN ENVIRONMENT

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Toxicological studies have shown evidence of toxicity of ultrafine particle concentration (UFP diameter < 100 nm). The processes leading to UFP emission, formation and growth is an area of on-going research and was the emphasis of an intensive measurement program carried out during summer 2011 and autumn 2012 in Sydney Australia. The formation and growth of UFP was observed during both seasons on 50% of days. VOC oxidation was observed on all days; however the partitioning or condensing of the oxidised species from the gas to the particle phase only occurred on half of the days. There was no difference in the existing insitu aerosol microphysical properties between days of particle growth and no growth, and meteorological state variables were not strong predictors of particle growth.

We used a chemical transport model coupled with an aerosol microphysical model to investigate the relationship between emissions, transport, chemistry and particle growth. Inclusion of a boundary layer sulphuric acid nucleation scheme resulted in the reproduction of the particle growth events with sulphuric acid generated from the chemical transformation of sulfur dioxide and sulfur trioxide emitted by power stations in the region. Observations suggest that the atmospheric composition and photochemical environment of Sydney is such that photochemical oxidation (and thus the production of condensable materials) is a common occurrence in the Sydney airshed. However in order for the oxidised products to partition to the particle phase and contribute to particle growth an acid catalyst is required and sulfate in the power station plumes nucleates to form theses catalyst seeds. Typically the power station plumes lie above the boundary layer in the morning, and are then fumigated to the surface in the early afternoon as convection leads to boundary layer growth. This process provides a reservoir of the seed particles onto which the oxidised VOC products can partition and condense and further react.

S4.14 - OBSERVING THE ANTHROPOCENE FROM SPACE

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The industrial revolution, which began in the UK in thelate 18th century, has been fuelled by the use of cheap energy from fossilfuel combustion. It has facilitated a dramatic rise in both the humanpopulation, now above 7 Billion with 50% now living in urban agglomerations,and its standard of living. It is anticipated that by 2050 there will be of theorder of 8.3 to 10 billion people, 75% living in cities. Anthropogenic activityhas resulted in pollution from the local to the global scale changes in landuse, the destruction of stratospheric ozone, the modification of biogeochemicalcycling, acid deposition, impacted on ecosystems and ecosystem services,destruction of biodiversity and climate change. The impact of man has moved theearth from the Holocene to the new geological epoch of the Anthropocene. Toimprove our understanding of the earth atmosphere system and the accuracy ofthe prediction of its future changes, knowledge of the amounts anddistributions of trace atmospheric constituents are essential -“One cannot manage what is not measured”.

An integrated observing system, comprising ground andspace based segments is required to improve our science and to provide anevidence base needed for environmental policymakers. Passive remote sensingmeasurements made of the up-welling radiation at the top of the atmosphere frominstrumentation on space borne platforms provide a unique opportunity toretrieve globally atmospheric composition. This presentation describes resultsfrom the SCIAMACHY (SCanning Imaging Absorption spectroMeter for AtmosphericCHartographY on ESA Envsiat 2002 to 2012) and its spin offs GOME (Global OzoneMonitoring Experiment ESA ERS-2 1995 to 2011) and GOME-2 (ESA/EUMETSAT Metopseries). The potential of the SCIAMACHY successors Sentinel 5, CarbonSat, and SCIA-ISSwill also be addressed.

SESSION 5 - ATMOSPHERIC CHEMISTRY FUNDAMENTALS

S5.1 - A NEW CLASS OF LOW-VOLATILITY ORGANIC COMPOUNDS IN NEW PARTICLE FORMATION.

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Recent studies show that peroxy radicals are key intermediates in particle formation. Permutation reactions involving highly oxidized peroxy radicals form stable products with extremely low volatility (ELVOC). We suggest that ELVOC are the postulated organic compounds that explain growth of small particles (Ehn et al., Nature, 2014). To elucidate the pathways of ELVOC formation, experiments were performed in the Juelich Plant Atmosphere Chamber. As unique detection schemes we applied High Resolution Nitrate-Chemical Ionization Mass Spectrometry for detection of ELVOC including highly oxidized peroxy radicals. ELVOC were produced by a-pinene ozonolysis and reaction with OH at different NOX levels. ELVOC with C10 skeletons carry a large number of oxygens, still containing 14 or 16 H-atoms. ELVOC-dimers with 20 C-atoms were also observed. The formation of ELVOC with even number of O-atoms can be explained by classical peroxy radical termination reactions leading to ketones, alcohols, and hydroperoxides (including peroxy acids) in combination with fast intramolecular hydrogen shifts. H-shifts in peroxy radicals lead to formation of an increasing number of hydroperoxide groups under reproduction of a peroxy radical (containing now two more oxygens). Formation of ELVOC with odd numbers of O-atoms requires in addition alkoxy radicals as intermediates in the sequential radical chain. Peroxy radicals with 6, 8, and 10 O-atoms were more abundant than those with 7 and 9 O-atoms. Addition of NOx to the system increases the concentrations of nitrates on cost of corresponding peroxy radicals, confirming their identification as peroxy radicals. Furthermore the concentrations of ELVOC-dimers decrease strongly with increasing NO suggesting that they are indeed formed by peroxy- peroxy permutation reactions. ELVOC are involved in new particle formation, and can explain the major fraction of the early growth observed in field studies. Key molecules in new particle formation must be ELVOC-dimers as their formation is strongly supressed with increasing NOx in accordance with the NOx dependence of new particle formation described by Wildt et al. (ACP, 2014). Formation of particle mass is less affected by NOx addition as it likely proceeds via C10-ELVOC.

S5.2 - HIGH MOLECULAR WEIGHT / LOW VOLATILE ORGANICS IN SOA: HOMOGENEOUS VS. HETEROGENEOUS FORMATION

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The formation of high molecular weight (MW) organics (i.e. highly oxidized, highly functionalized or increased MW due to oligomerization or accretion reactions) in the atmosphere has been investigated intensively during the last few years. The motivation for these studies is their very low vapor pressure and therefore their influence on the formation and the properties of atmospheric aerosols, e.g. gas/particle partitioning of

SOA, the phase state of organic aerosols and especially the still intensively debated question about the role of organic compounds in atmospheric new particle formation. In principle, the formation of low volatile or high MW organics can take place in the gas phase, i.e. reaction pathways involving organic radicals, such as Criegee radical chemistry or reactions of larger organic peroxy radicals (incl.autoxidation). A second potential pathway for their formation is condensed phase chemistry. Here, gas-particle transfer of smaller molecules (e.g. reactive carbonyls, peroxides) precedes the formation of higher MW organics and, if the partitioning coefficient indicates that the smaller organics will exist mainly in the gas phase, the formation process can be treated as reactive uptake. Recently several new analytical methodologies for SOA characterization – mostly based on online (e.g. CIMS) and offline mass spectrometry (high resolution MS) - have been developed and applied in field and laboratory studies. The contribution will present the current state of understanding of the formation of high MW / low volatile organics from natural precursors, including results from a field campaign in the Amazonian rainforest.

S5.3 - A COMBINED ELVOC STUDY AT THE LEIPZIG AEROSOL CHAMBER (LEAK) AND AT THE TROPOS RESEARCH STATION MELPITZ

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Extremely low volatility organic compounds (ELVOCs) have recently been observed in the laboratory and in the field. Within this contribution, results on the ELVOC are presented form CI-API-TOF measurements at the Leipzig aerosol chamber (LEAK) in a batch reactor continuous flow setup mode which enables realistic reaction conditions. ELVOCs were identified with the CI-API-TOF and their uptake into seed aerosol was studied. A variety of offline analytical techniques has then been employed to identify which molecules can actually be identified as SOA constituents. Some ELVOC have been also found in the particle phase and a strong production of organosulphates was observed. It will be discussed whether the organosulphates are linked with the ELVOCS in the gas phase. For comparison, a first focussed field campaign has been performed at the TROPOS research station in Melpitz in summer 2013. Surprisingly, high concentrations of ELVOCs have been measured, with many of the mass spectrometric signals being identical to those observed in the lab before. However, besides ELVOCs from a series of monoterpenes there are indications that other precursors also lead to the formation of ELVOC. The gas phase production of ELVOCs and their partitioning will be discussed together with its possible impacts on tropospheric chemistry. Current uncertainties and the need for further research will be assessed.

S5.4 - COMPREHENSIVE SPECIATION OF ORGANIC AEROSOLS REVEALS EVAPORATION AND OXIDATION KINETICS OF LONG-CHAIN NORMAL ALKANES

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A large fraction of primaryparticulates in the troposphere consist of long-chain hydrocarbons that can evaporatefrom the particle phase to the vapor phase; they can also be readily oxidizedin both phases, following different reaction schemes and leading to oxygenatedproducts with different isomeric distributions. In the present study, evaporationand OH-initiated oxidation of four long-chain normal alkanes (n-octadecane, n-eicosane, n-docosane,and n-tetracosane) were examined in aflow tube reactor. Particle-phase samples were collected and comprehensivelyanalyzed using a two-dimensional gas chromatograph coupled to a high-resolutiontime-of-flight mass spectrometer (GC×GC/HTOF-MS)with vacuum ultraviolet (VUV) photoionization. Both functionalization (up tothird generation) and fragmentation oxygenated products were measured andquantified. More importantly, most of the oxygenated higher molecular weightconstitutional isomers were separated. Ketone and alcohol functional groups atspecific carbon positions were comprehensively identified by their unique VUVmass spectra. A semi-explicit kinetic model was also developed to simulate allmeasured species and evaluate the evaporation and oxidation kinetics based onthe observed constitutional isomers. The results suggest both evaporation andoxidation occurred simultaneously and the product isomer distributioneffectively reveals the relative importance of the two processes. Long-chainalkane ketone isomers were also observed from urban aerosol samples. Along withthe hydrocarbon measurements, the chemical evolution kinetics of long-chainalkanes in the atmosphere was interpreted. This work demonstrated that isomeranalyses could provide a new metric to estimate chemical evolution kinetics of long-chainhydrocarbons.

S5.5 - IMIDAZOLE-2-CARBOXALDEHYDE, A NEW EFFICIENT PHOTOSENSITIZER: FUNDAMENTAL KINETICS AND PROPOSED MECHANISM FOR THE FORMATION OF HALIDE RADICALS.

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Imidazoles get growing interest in atmospheric chemistry, since catalytic process in situ involving ammonium salts and glyoxal, two ubiquitous component of ambient particulate matter, could lead to their significant formation [1,2]. Recently, our group showed that imidazole-2-carboxaldehyde (IC), one of the products formed by the 'iminium-pathway', can efficiently photo-induce the growth of aerosols by the production of highly oxygenated limonene oxidation products without the presence of any gas phase oxidant [3,4].

Imidazole compounds are also known to be present in the sea surface microlayer (SML), the thin interfacial zone between atmosphere and subsurface water [5], and IC could certainly be one of them. Photoactive compounds in the SML can produce active halogen species after oxidation of halides. Photo-activated aromatic carbonyls, like benzophenone, and other photoactive compounds like chlorophyll, can lead to the formation of the reactive radical anion (X2•-) and molecular halogens, that can be released in the gas-phase [8]. Gas-phase halogen atoms, especially iodine and bromine, will set in catalytic cycles of ozone destruction in the MBL, changing locally the oxidizing capacities and gas-phase iodine chemistry can also lead to particle formation [9].

The aim of this work is to explore the photochemical properties of IC by the means of laser flash photolysis. The absorption spectrum of the triplet state of IC in aqueous solution was measured and the bimolecular rate coefficients of IC in presence of halide anions determined. Iodide anions showed to be efficient quenchers of the triplet state of imidazole-2-carboxaldehyde, with a rate coefficient kq of (5.33 ± 0.25) x 109 M-1 s-1. The quenching by bromide and chloride anions was less efficient, with respective rate coefficients of (6.27 ± 0.53) x 106 M-1 s-1 and (1.31 ± 0.16) x 105 M-1 s-1. The halide (X-) quenches the triplet state by an electron transfer mechanism and the resulting transient absorption feature matches that of the corresponding radical anion (X2-).

We suggest that this type of direct photochemical reactions is a driving force of oxidation reactions in the oceanic SML and consequently a significant source of halogen atoms in the atmosphere.

Bibliography:

B. Nozière, P. Dziedzic, A. Cordóva, J. Phys. Chem. A 112 (2009) 231
G. Yu, A. R. Bayer, M. M. Galloway, K. J. Korshavn, C. G. Fry, F. N. Keutsch, Environ. Sci. Technol. 45 (2011) 6336
K. Z. Aregahegn, B. Nozière, C. George, Faraday Discuss. 165 (2013) 123
S. Rossignol, K. Z. Aregahegn, L. Tinel, L. Fine, B. Nozière, C. George, Environ. Sci. Technol. (2014) DOI: 10.1021/es405581g
P. S. Liss, R. A. Duce, The Sea Surface and Global Change, Cambridge University Press, Cambridge, UK, 1997
R. Sinreich, S. Coburn, B. Dix, R. Volkamer, Atmos. Chem. Phys. 10 (2010) 11359
M. C. Facchini, S. Decesari, M. Rinaldi, C. Carbone, E. Finessi, M. Mircea, S. Fuzzi, F. Moretti, E. Tagliavini, D. Ceburnis, C. D. O'Dowd, Environ. Sci. Technol. 42 (2008) 9116
A. Jammoul, S. Dumas, B. D'Anna, C. George, Atmos. Chem. Phys. 9 (2009) 4229
L. J. Carpenter, Chem. Rev., 103 (2003) 4953

S5.6 - IMPACT OF OXIDATIVE AGING ON THE CHEMICAL COMPOSITION AND OPTICAL PROPERTIES OF BROWN CARBON AEROSOLS

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Particulate and gaseous emissions from biomass combustion are known to have numerous air quality and climate impacts. Light absorbing carbonaceous aerosol is a subset of biomass combustion emissions that has recently received significant attention due to its ability to potentially warm the climate. Although soot (black/elemental carbon) has long been recognized as an important absorber of solar radiation, brown carbon (BrC – light absorbing organic carbon) has been more recently recognized as a potentially important climate forcer. In general, BrC remains poorly constrained, in part due to its numerous sources and the variety of chemical functional groups that may contribute to UV and visible absorption. Of particular importance for calculating an integrated climate impact is how the functional groups responsible for absorption change ("age") over the atmospheric lifetime of the aerosol. Here, we present data quantifying how the chemical composition and optical properties of BrC aerosols are altered via oxidation. The BrC is generated in the absence of soot via the smoldering of biomass. It is then aged in a flow tube by oxidation using OH and ozone with and without the presence of gaseous smoldering emissions. We find that aging alters the chemical and optical properties of the BrC on atmospherically relevant time scales. Using the measured chemical composition, we postulate possibilities for the light absorbing functional groups and link the observed changes in chemistry to the optical changes.

S5.7 - COMPLEX REFRACTIVE INDICES IN THE NEAR-ULTRAVIOLET SPECTRAL REGION FOR BIOGENIC SECONDARY ORGANIC AEROSOL AGED WITH AMMONIA

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Atmospheric absorption by brown carbon aerosol may play an important role in global radiative forcing. Brown carbon arises from both primary and secondary sources, but the mechanisms and reactions for the latter are highly uncertain. One proposed mechanism is the reaction of ammonia or amino acids with carbonyl products in secondary organic aerosol(SOA). We generated SOA in situ by reacting biogenic alkenes (a-pinene, limonene, and a-humulene) with excess ozone,humidifying the resulting aerosol, and reacting the humidified aerosol with gaseous ammonia. We determined the complex refractive indices (RI) in the 360 –420 nm range for these aerosols using broadband cavity enhanced spectroscopy(BBCES). The average real part (n) of the measured spectral range of theNH3-aged a-pinene SOA increased from n = 1.50 (± 0.01) for the unreacted SOA to n = 1.57 (± 0.01) after a 1.5h exposure to 1.9 ppm NH3; whereas, the imaginary component (k) remained below k <0.001 (± 0.002). For the limonene and a-humulene SOA the real part did not change significantly, and we observed a small change in the imaginary component of the RI. The imaginary component increased from k = 0.0 to an average k = 0.029 (± 0.021) for a-humulene SOA,and from k < 0.001 (± 0.002) to an average k = 0.032 (± 0.019) for limonene SOA after a 1.5 h exposure to 1.3and 1.9 ppm of NH3, respectively. Collected filter samples of the aged and unreacted a-pinene SOA and limonene SOA were analyzed off-line with nanospray desorption electrospray ionization high resolution mass spectrometry(nano-DESI/HR-MS), and in-situ with a Time-of-Flight Aerosol Mass Spectrometer, confirming that the SOA reacted and that various nitrogen-containing reaction products formed. If we assume that NH3-aging reactions scale linearly with time and concentration, then a 1.5 hreaction with 1 ppm NH3 in the laboratory is equivalent to 24 h reaction with 63 ppbv NH3, indicating that the observed aerosol absorption will be limited to atmospheric regions with high NH3 concentrations.

S5.8 - HETEROGENEOUS UPTAKE OF HO2 RADICALS TO AEROSOLS. MECHANISTIC INSIGHTS FROM LABORATORY MEASUREMENTS AND KINETIC MODELLING.

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HO2 radicals play a critical role in the atmosphere. Their reaction with NO provides a major recycling step to OH radicals and a dominant contribution to the formation of tropospheric ozone. The lifetime of HO2 is sufficiently long that uptake to aerosols may constitute an important component of its budget, yet quantitative comparisons of field-measured and modelled concentrations have been hampered by uncertainties in the uptake coefficient (g) of HO2 to aerosols. Here we present laboratory measurements of g for a range of aerosol types using an aerosol flow tube coupled with a sensitive laser-based detection method enabling use of HO2 concentrations close to ambient levels. For inorganic salts, g was measured to be in the range 0.003-0.02 and < 0.004 for aqueous and dry aerosols, respectively, and 0.4 for Cu(II) doped ammonium sulphate. g increased significantly as a function of Cu(II) and Fe(II or III) within the aerosol, and also increased at lower temperatures. For 6 organic aerosols (glyoxal, squalene, glutaric, malonic, stearic and oleic acids) g was < 0.004 - 0.008, but for humic acid, which contains transition metal ions, g = 0.007 – 0.09. For sucrose doped with Cu(II), g increased from 0.02 - 0.2 for 17-75% relative humidity, over which the viscosity, and hence the diffusion constant of HO2, changed significantly. For Cu(II) doped ammonium sulphate, g reduced significantly in the presence of EDTA and oxalic acid complexing agents. Uptake onto a-pinene and trimethylbenzene derived SOA generated in situ at the Paul Scherrer Institute smog chamber was small (g £ 0.004), and g = 0.018-0.031 was determined for Arizona Test Dust aerosols. Insights into the mechanism for HO2 uptake and identification of the rate limiting steps as a function of experimental variables was probed using the KM-SUB kinetic multi-layer model which resolves mass transport and chemical reaction at the aerosol surface and in the bulk. The KM-SUB model was able to reproduce the experimental observations of g decreasing with both aerosol exposure time to HO2, and with HO2 concentration, with implications for the correct choice of g for inclusion in atmospheric models.

SESSION 6 - ATMOSPHERIC CHEMISTRY IN A CHANGING CLIMATE

S6.1 - CLIMATE RESPONSES TO PERTURBATIONS OF SHORT-LIVED CLIMATE FORCERS

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Short-lived climate forcers (SLCFs) have impacts both on climate, through radiative forcing effects, and on air quality, by contributing to PM and tropospheric ozone concentrations. There are fundamental scientific uncertainties in characterizing both the climate and air quality impacts of SLCFs and many aspects, such as the regional dependence, are quite different to those for the longer-lived climate gases. This work is part of the EU-FP7 project ECLIPSE, which aims to develop and assess effective emission abatement strategies for SLCFs in order to provide scientific advice on how to mitigate climate change while improving the quality of air. In this contribution we assess the climate impacts of perturbations to anthropogenic emissions of different SLCFs: namely SO2, black carbon, organic carbon, NOx, VOCs, CO and methane. We use climate integrations from three state-of-the-art fully-coupled atmosphere-ocean models with interactive chemistry and aerosols (HadGEM, ECHAM and NorESM). The simulations consist of a control simulation with present-day emissions, and a set of perturbation experiments in which the anthropogenic component of each SLCF is removed. A further perturbation experiment with no shipping emissions is also included. We evaluate the effects of these perturbations on climate, including surface temperature, precipitation, evaporation, run-off and ecosystem productivity – both on a global and regional level. This is the first time that such experiments have been run in fully-coupled climate models, and therefore this is the first time that the full climate impact of these SLCFs can be evaluated.

S6.2 - WILDFIRE AND REGIONAL CLIMATE VARIABILITY: A GLOBAL PERSPECTIVE

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Fire is an essential part of the natural system. It is also a key component in the development of human societies. In particular, wildfire is strongly affected by regional climate and plays an important role in regulating regional climate variability. Using the Community Earth System Model (CESM), we examine the current capability of climate models to simulate the interactions between wildfire aerosol emissions and regional climate variability and identify key areas that require significant improvements. We will also show the teleconnection between African wildfire and East Asian summer monsoon and the underlying physical and dynamical processes, a global reconstruction of fire activities during 1901-2007 and the long-term effects of human activities and climate change on fires, and the impact of black carbon emissions from fires on the Arctic climate.

S6.3 - EXAMINING THE OBSERVED AND MODELED SENSITIVITIES OF AIR-QUALITY EXTREMES TO METEOROLOGICAL DRIVERS USING ADVANCED STATISTICAL TECHNIQUES

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High levels of ozone(O3) and fine particulate matter (PM2.5) havewell-documented negative impacts on human health and society, making them twoof the most commonly regulated pollutants worldwide. Mean levels of thesepollutants are primarily determined by both local climatology and emissionrates, but day-to-day pollutant variability is driven mostly by meteorological fluctuationsrather than variability in the emissions themselves. Changes in localclimatology, therefore, are likely driving changes in local air quality, bothin terms of mean pollutant levels as well as the frequencies and magnitudes ofextreme events. While the impact of changing meteorology on O3 and PM2.5has been explored previously, much of the existing literature has focused on averagesand linear regressions, statistical techniques that largely ignore extremebehavior and tail dependence. Since current air-quality standards often includelimits on high quantiles of pollutant level observations (e.g. annual 4thhighest daily maximum 8-hour concentration of O3 and 98thpercentile of PM2.5 in the UnitedStates), statistical analyses that do not focus on tail dependence will beunable to fully evaluate impacts on exceedance frequencies. Using methodologiesbased on quantile regression (QR) and extreme value theory (EVT), toolsspecifically developed for the analysis of heavy-tailed phenomena, we analyzerelationships between meteorology and extreme pollution episodes in the UnitedStates, both in the observed data record and in modeled output generated by theCommunity Earth System Model (CESM). Through this analysis, we propose astatistical framework for the identification of the meteorological drivers ofthese air-quality extremes, the evaluation of modeled extremes, and the improvementof future extreme projections based on observed sensitivities and assumed climatologicalchanges. Although this work focuses on the United States, the methodologiesdeveloped here are general, and the results provide insight into meteorologicalcontrols on air quality throughout the world.

S6.4 - IMPACT OF AGRICULTURAL EMISSIONS ON FUTURE CLIMATES

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Future emission scenarios project agrowing world population with increased food demands. Taking into accountdifferent factors of population growth, fertilizer applications, and increasedefficiencies in food production leads to an estimated of doubled ammoniaemissions by the end of the century under the highest IPCC scenario. Growing emissions from the agricultural sector, most importantlythe use of fertilizers, are the driving force behind nitrate aerosol loadchanges in the atmosphere. Global agriculture has become steadily moredependent on synthetic nitrogenous compounds without whose applications wewould not be able to produce roughly half of today's world food.

In order to examine the future atmosphericcomposition and its impact on climate we have to consider opposite forcingeffects: GHG have awarming effect. Ozone changes have both a warming (as a greenhouse gas) and acooling (through the formation of the OH radical in the troposphere whichreacts with CH4, and through aerosol formation) effect. The neteffect, including direct and indirect effects, of increased nitrate aerosolconcentrations has a cooling effect.

Inthis study we use the GISS-E2 climate model with sophisticated aerosolmicrophysics and interactive chemistry schemes and investigate climate impactsof emissions of the agricultural sector on aerosol loads and atmosphericchemistry, with special emphasis on the role of nitrate aerosols. We investigatefuture climates by using two different aerosol and two differentthermodynamical schemes, which will give us uncertainty estimates regardingaerosol treatments. It is found in this study that ammonium nitrate particlesbecome the dominant contributor to the future direct forcing of aerosols butonly plays a minor role for cloud forcing changes. In addition, in terms ofregional air quality, nitrate levels at the surface are also significantly affectedby future emissions of nitrate precursors with consequences on Particulate Matterlevels in Northern America, Europe and Asia.

S6.5 - INTEGRATED ANALYSIS OF AIR POLLUTION AT ANTARCTIC: AN OVERVIEW OF THE BRAZILIAN ANTARCTIC MONITORING AND THE BRAZILIAN STANDALONE MODULE - CRIOSFERA 1

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Integrated analysis of air pollution at Antarctic: an overview of the Brazilian Antarctic Monitoring and the Brazilian standalone module - Criosfera 1Ricardo H.M. Godoi1*, Ana F. L. Godoi1, Renata C. Charello1, Kelvin Black dos Santos1, Sergio J Gonçalves Jr1; Heitor Evangelista2, Elaine Alves dos Santos2; 1 Department of Environmental Engineering, Federal University of Parana - UFPR, Curitiba - PR, Brazil; 2 Laboratório de Radioecologia e Mudanças Globais, Universidade Estadual do Rio de Janeiro-UERJ, RJ, Brazil; AbstractOver the past 50 years, the Antarctic continent recorded the largest increase of atmospheric temperature compared to other continents. The range of +2.5 Celsius degrees is contrasted with the global average increase of +0.6 Celsius degrees for the last 140 years. Key mechanisms behind this warmer climate acceleration have been identified as the melting and thinning of the floating ice shelves triggered by warm ocean water. We hypothesize that the West Antarctic warming can be related to the aerosols transported and/or formed in this region. Thus, the analysis of the aerosols composition is essential to clarify the behavior of the aerosols in the atmosphere and its effects on the heating and cooling of this pristine area, since the atmospheric aerosols can influence climate change directly or indirectly.One of our research proposes is to study the aerosol dispersion from Rio de Janeiro to the Brazilian Antarctic Station at King George Island. Individual Antarctic aerosol particles were analyzed by low-Z EPMA and the bulk of particles by EDXRF, in order to investigate the elemental composition of particles and bulk samples. EPMA results show high contributions of sulphur, sea salts, aluminosilicates, iron rich and a few soot particles. Alongside to the cruise, the elemental concentration results revealed two main groups. The first group is originating mainly from natural sources, and the second group to be related to long-range transport of anthropogenic aerosol. The monitoring of BC showed that the enhanced concentrations from urban origin can be transported to the South–West Atlantic Ocean due to the migration of sub-polar fronts that frequently reach tropical/subtropical regions.Our actual project (2010-2014) aims to improve the understanding the impact of aerosols in Central West Antarctica, based on the standalone module - Criosfera 1, which started operation during the early 2011/2012 summer period.

S6.6 - TRANSFORMATION OF AEROSOL CHEMICAL COMPOSITION AND RESULTANT IMPACT ON CLIMATE DURING THE SOUTH AMERICAN BIOMASS BURNING ANALYSIS (SAMBBA)

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Biomass burning represents one of the largest sources of particulate matter to the atmosphere, resulting in a significant perturbation to the Earth's radiative balance coupled with serious impacts on public health. Globally, biomass burning aerosols are thought to exert a small warming effect but with the uncertainty being 4 times greater than the central estimate. On regional scales, the impact is substantially greater, particularly in areas such as the Amazon Basin where large, intense and frequent burning occurs on an annual basis for several months. Absorption by atmospheric aerosols is under estimated by models over South America, which points to significant uncertainties relating to Black Carbon (BC) aerosol properties. Results from the South American Biomass Burning Analysis (SAMBBA) field experiment, which took place during September and October 2012 over

Brazil on-board the UK Facility for Airborne Atmospheric Measurement (FAAM) BAe-146 research aircraft, are presented here. Aerosol chemical composition was measured by an Aerodyne Aerosol Mass Spectrometer (AMS) and a DMT Single Particle Soot Photometer (SP2). The transformation of the physical, chemical and optical properties of the aerosols across the region will be characterized in order to establish the impact of biomass burning on regional weather and climate.

The aircraft sampled a range of fire conditions, both in terms of their number, intensity, vegetation-type and their combustion efficiencies. The aircraft sampled biomass burning aerosol across the southern Amazon in the states of Rondonia and Mato Grosso, as well as in a Cerrado (Savannah-like) region in Tocantins state. BC-containing particles were found to be rapidly coated in the near-field, while the organic aerosol component was observed to oxidise rapidly upon advection and dilution downwind of major smoke plumes. Significant differences in the coating thickness of the BC-containing particles and their optical properties were observed when comparing the Rainforest and Cerrado environments.

Such properties have important implications for the lifecycle and formation of particulate material, as well as their optical and radiative properties. The results presented enhance our knowledge of biomass burning aerosol in a sensitive region of the globe, where relatively few measurement campaigns have taken place previously.

S6.7 - CONNECTING AIR QUALILTY AND CLIMATE OVER AND DOWNWIND SANTIAGO DE CHILE

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Santiago de Chile is a ca. 6 million inhabitant city where substantial emissions of pollutants and pollutant precursors occur. This has resulted in numerous studies and political measures over the last 20 years intended to understand and curb acute and chronic impacts on people's health, as well as detrimental impacts on ecosystems. However, these efforts have remained largely decoupled from climate studies and the search for mitigation and adaptation measures to face climate variability and change in Chile. In this work, I revisit the different sources of information and knowledge aiming at identifying ways to connect air quality and climate issues in the case of Santiago. I focus on the reconciliation between national and local emission inventories, and between current air quality monitoring and needs for assessing the impact by short-lived climate forcers.

S6.8 - THE IMPACT OF CLIMATE ON AIR QUALITY - STUDIES FROM THE EASTERN US

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Changes in climate can have profound impact on atmospheric composition and air quality. Remote and in situ observations as well as chemical transport models have been employed to understand the atmospheric response to changes in climate past and future. Over the eastern US the number of hot days has been observed to be increasing over the past decades. Pollution ozone correlates with higher temperatures due to several interacting biological, meteorological, and chemical factors such as increased isoprene emissions and increased photochemical reactions, but economic factors play a role as well. The increased demand for electricity on hot days increases emissions. This indicates that at least one aspect (NOx emissions from power plants) of the Climate Penalty Factor is under human control. We will discuss observed climate change, predictions of future regional climate, links to the biosphere, and policy based on the best available science.

S6.9 - OPERATIONAL AIRCRAFT OBSERVATION OF ATMOSPHERIC CO2, CH4, CO AND N2O IN THE MID-TROPOSPHERE OVER THE WESTERN NORTH PACIFIC

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Japan Meteorological Agency has started an operational aircraft measurement program in 2011, and observed mole fractions of carbon dioxide (CO2), methane (CH4), carbon monoxide (CO) and nitrous oxide (N2O) in the mid-troposphere over the western North Pacific region. In this program, a C-130H cargo aircraft is used and it flies regularly from Atsugi Base, which is located near Tokyo, to Minamitorishima, an isolated island located about 1,860 km southeast of Tokyo, collecting about 24 flasks of air samples along the flight route once a month. Analysis results suggest strong influences of anthropogenic/biospheric sources and sinks in East and South Asia on the observed mole fractions variations. Details of the measurement program and the preliminary data analysis results will be presented.

Generally, intensive observation campaigns in the mid-troposphere using research aircraft are conducted only for short time period. Recently, for example, a major aircraft measurement project named Comprehensive Observation Network for Trace gases by Airliner (CONTRAIL) has provided a large amount of CO2 mole fraction profiles in the horizontal in the upper-troposphere. But there was a significant lack of a long-term monitoring (spatially and temporally) in the mid-troposphere over the western Pacific region.

The continuation of this aircraft measurement program would promote our understanding of the spatial variations of the greenhouse gas fluxes in Asia and of those long-term variations induced by the rapidly growing human activities and climate changes. The data are available from the World Data Center for Greenhouse Gases (WDCGG) under WMO Global Atmosphere Watch (GAW) Programme.

S6.10 - QUANTIFYING EMERGING LOCAL ANTHROPOGENIC EMISSIONS IN THE ARCTIC REGION: THE ACCESS AIRCRAFT CAMPAIGN EXPERIMENT

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Climate change has opened the Arctic region to new industrial activities, most notably transit shipping and offshore oil/gas extraction. However, the impact of emerging Arctic industrial activities on pollutant levels and regional climate are not well understood. In order to better understand how these activities influence Arctic tropospheric chemistry and composition, we conducted the ACCESS (Arctic Climate Change, Economy, and Society, a European Union Seventh Framework Programme project) aircraft campaign in July 2012. During ACCESS, the DLR Falcon research aircraft was based in Andenes, northern Norway, and was equipped with a suite of trace gas and aerosol instruments (black carbon, ozone, as well as other trace species). Emissions from different ships (e.g. cargo, passenger, and fishing vessels) and a variety of offshore extraction facilities (e.g. drilling rigs, production and storage platforms) off the Norwegian Coast were characterized in detail during nine scientific flights. We found distinct differences in chemical and aerosol composition emissions released by these emerging pollution sources. In addition to our measurements, we used a regional chemical transport model to study the impact of local pollution sources on gas and aerosol concentrations in the region. To put the emerging local pollution within a broader context, we also studied the composition of biomass burning plumes imported from boreal forest fires. We will present an overview on the measured trace gas and aerosol properties of the different emission sources and discuss the influence of future local anthropogenic activities on the Arctic air composition by combining measurements with model simulations.

POSTERS ABSTRACTS

SESSION 1 - ATMOSPHERE-SURFACE (OCEAN/VEGETATION/ICE) INTERACTIONS IN A CHANGING CLIMATE

P1.1 - SUBMICROMETER MARINE SECONDARY ORGANIC AEROSOL AND MSA OVER THE NORTHERN AND SOUTHERN ATLANTIC OCEAN

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Intensive physical and chemical characterization of the submicrometer marine aerosol of the Atlantic Ocean has been performed on the German RV Polarstern during four transects from the Northern to the Southern hemisphere. One focus of the analysis has been givento secondary organic aerosol and its influence on the hygroscopicity. MSA mass concentrations were determined using High Resolution Time of Flight Aerosol Mass Spectrometer (HR-ToF-AMS). MSA was extracted from the AMS measurements performed for 4 cruises providing MSA mass concentration in 4 min time-resolution. To valid the method, MSA concentrations derived from AMS measurements were successfully compared with concomitant and parallel offline high volume measurements (DIGITEL PM1, 24h). For better understanding the organics sources of the aerosol over the Atlantic Ocean, the positive matrix factorization (PMF) was applied based on high resolution organic matrix fromHR-ToF-AMS. For each cruise, a marine secondary organic aerosol (MSOA)component was found. High mass concentration of SOA as well as the mass fraction of MSOA can be explained by the biogenic activities in spring. Additional,most of the time, we measured under clean marine condition, since the ship was far from the coast. The ratio MSOA/MSAwas used to estimate the MSA contribution to total marine SOA. MSOA/MSA ratios showed clear dependence on region and season, especially in the spring when marine phytoplankton was more active.

P1.2 - ASSOCIATION BETWEEN THE CONCENTRATION OF CARBON MONOXIDE AND MORTALITY RATE FOR ACUTE MYOCARDIAL INFARCTION THE POPULATION IN SÃO PAULO, BRAZIL.

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The objective of thiswork was to verify the association between the concentration ofcarbon monoxide (CO) and theoverall mortality rate of the populationresident in the São Paulo city, for Acute Myocardial Infarction (AMI) in the period from 2000 to2013. Usingdata from the Mortality System (SIM) and the Company of Environmental Technologyof São Paulo (CETESB). Carbon monoxide is aproduct of incompletecombustion present in any combustion process that originates from the motorvehicles upto a burningcigarette, this hasvery large combinatorial trend withhemoglobin. Located within red blood cells, hemoglobin carries oxygen toallorgans and tissues of the human body. Once the CO binds to hemoglobin,that hardlyback totransport oxygen. The compound betweenhemoglobin andcarbonmonoxide iscalled methaemoglobin, and theorgans and tissues are sufferinga lack of oxygen. To addressthe lack of oxygen transport by hemoglobinsgoals,theheart isto pump bloodfaster, ina maneuver to meet withhemoglobin not compromisedthe oxygento tissues and organs. Thus, in patients withheart previouslysick,there is compromising the heart, leadingto heart attack. To check thestandard of the trenddecomposition of time series. In addition, we used the modelof thegeneralized estimation equationsto capture significant associations between thepollutant concentration and themortality rate andthe risk created.Statistical methodshave been developed through the Rsoftware (2.15.0).The results show that the highest occurrence of concentration and ofdeaths, on average, was in July,detecting theoccurrence of decreasing trend in both series,mainly in2002, 2006and 2012.The CO concentration was significantly associated with deaths due to AMI(p-value = 0 <0.001), increasing therisk in 1.6% (95% CI 0.96 -1.18) foreach elevation of 9 ppm. Theresults suggest that air pollution caused bythe increase concentration of carbon monoxiderepresents an important risk factor formortality from acute myocardial infarction, in São Paulo.

P1.3 - BVOC PROFILES AT THE AMAZONIAN TALL TOWER OBSERVATORY SITE.

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The Amazon rainforest is a unique ecosystemwhere the behavior of BVOC (Biogenic Volatile Organic Compound) is greatlyaccentuated due to a great biomass, radiation and humidity and can influenceaerosol growth, precipitation dynamics and alter the oxidation capacity of theatmosphere. We present online measurements of BVOC made at an 80m tower at theATTO site in a Central Amazonian site. Major compounds measured by a PTR-MS weremethanol, acetonitrile, acetaldehyde, acetone, isoprene, MVK+MACR (methyl vinylketone and methacrolein), methyl ethyl ketone and monoterpenes for the periodof the wet season (February/March 2013) and dry season (September 2013). Astriking feature was found with a more active subcanopy in term of emissionsthan the top of the canopy for the dry season for some compounds. Profiles showhow chemically similar compounds follow similar diurnal and vertical patternsdepending on season and time of day. These results will allow for betterunderstanding of how the plant-atmosphere interactions work within an Amazonianecosystem.

P1.4 - THE ROLE OF FIRE EMISSION HEIGHTS IN THE CLIMATE SYSTEM: AN ECHAM-6-HAM2 MODELLING STUDY

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We use the global circulation model ECHAM6 extended by the aerosol module HAM2 to investigate how the variability of fire emission heights impacts our climate. Vegetation fire emission heights determine the height, at which smoke plumes release emissions into the atmosphere. In order to quantify the impact of natural or climate change related variations in the emission heights on the global aerosol transport and subsequent radiative effects, we carry out multi-year ECHAM6-HAM2 simulations with various plume height parametrizations. By application of two extreme scenarios with pure near-surface and pure free tropospheric emission injections, we identify natural constraints for variations in emission heights. Besides simulations with the ECHAM6-HAM2 standard plume height implementation, our most realistic scenarios are based on emission height predictions by a semi-empirical 1-D plume model. Additional simulations take into account diurnal variations in emission heights and uncertainties in the vertical emission distribution. For all scenarios, we analyze the changes in global atmospheric aerosol concentrations, aerosol deposition rates and radiative effects. Here, we will present first results that show significant changes in the global atmospheric black carbon and organic carbon particle concentrations for nearly all scenarios. The changes in the direct radiative aerosol effects turn out to be small even for the extreme scenarios. In contrast, indirect aerosol effects and enhanced soot deposition on snow in polar regions are found to be non-negligible. By comparison of the different emission height scenarios, we will be able to identify parameters relevant for a potential fire emission height - climate feedback.

P1.5 - HIGH-RESOLUTION VERTICAL PROFILES OF SPECIATED MONOTERPENES IN A CENTRAL AMAZONIAN TERRA FIRMA FOREST

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Monoterpenes play important roles in the biosphere and the atmosphere and contribute to the protection against abiotic stress, ecosystem signaling and communication, and land-atmospheric chemistry-climate interactions. Modeling studies suggest that globally, the Amazon Basin is the most important source of monoterpenes emitted to the atmosphere, yet a comprehensive study on monoterpene species and associated ambient concentrations and dynamics over time and space is lacking. Traditionally, previous studies focused on single monoterpene species found in leaf and branch enclosures or in ambient air, they are typically quantified as the summation of total monoterpenes with unknown accuracy. Given the vastly different biological activities and atmospheric reactivities of individual monoterpenes, we quantified12 individual monoterpenes in ambient air within and above a primary terra firma forest in the central Amazon Basin at a high vertical resolution using thermal desorption gas chromatography-mass spectrometry (TD-GC-MS) as part ofthe GoAmazon Terrestrial Ecosystem Science project. The results suggest that during November and December of the 2013 transition from dry season to wet season, monoterpene mixing ratios consistently remained highest at the top of the canopy and totaled up to 1.7 parts per billion on a per volume basis (ppbv), and within the canopy where leaf area is greatest reached up to 1.1 ppbv. D-limonene is the dominant monoterpene and reached maximum mixing ratios of 700 pptv followed by alpha -pinene and cis-beta ocimene (maxima of 300 pptv). Also detected in decreasing concentrations included sabinene, beta-pinene, trans-beta ocimene, camphene, terpinolene, gamma terpinene, beta thujene, beta-myrcene, and 3-carene. Consideration is given to individual monoterpene ratios to evaluate the role of environmental variables (temperature, light, relative humidity,precipitation, and CO2) and forest structure on monoterpene emissions. Our results have important implications for studying the ecological and atmospheric roles of monoterpenes in the Amazon Basin.

P1.6 - OVERVIEW OF EMISSIONS AND CHEMISTRY OF VOCS IN THE KATHMANDU VALLEY, NEPAL DURING THE SUSKAT-ABC FIELD CAMPAIGN DERIVED FROM THE FIRST PTR-TOFMS DEPLOYMENT IN SOUTH ASIA

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The Kathmandu Valley in Nepal has one of theworst air pollution problems in Asia but the role of ambient volatile organiccompounds (VOCs) in the Valley is poorly understood due to lack of emissionestimates, high resolution in-situ ambient data, and hence inadequateunderstanding of their chemistry. During the SusKat-ABC (Sustainable Atmosphorefor the Kathmandu valley-Atmospheric Brown Clouds) field campaign conducted inthe winter of 2012-2013, a Proton Transfer Reaction Time of Flight Mass Spectrometer(PTR-TOFMS) was deployed to identify and quantify a suite of ambient volatileorganic compounds in Kathmandu. More than 60 VOCs could be identified inambient Kathmandu air based on PTR-TOFMS mass scan (> 2s values whilemeasuring zero air for each m/z channel), highlighting the chemical complexityof ambient air in the valley. In contrast to most other urban environments, benzene concentrations (campaignaverage 3.31 ppbv) exceeded those of toluene (campaign average 1.87 ppbv) regularlydue to strong biomass combustion sources in the valley. Distinct diel profileswere observed for the nominal isobaric compounds isoprene (m/z = 69.0699) andfuran (m/z = 69.0334), which are normally not resolved using lower resolutionmass spectrometers and hence attributed primarily to isoprene. While isopreneshowed clear daytime maxima on sunny days due to emission from vegetation (peakvalue > 2.5 ppbv), furan peaked in the evening hours (peak value > 0.8ppbv) when combustion sources dominated. The occurrence of high levels of oxygenatedVOCs such as methanol, acetaldehyde and acetone (range of maximum values = 30 –50 ppbv) in winter was surprising. Their high correlation (r2 >0.6) with acetonitrile (a biomass burning tracer) revealed a significant biomasscombustion source. Acetonitrile levels (0.3 – 6.9 ppbv) were amongst highest reportedfrom urban/suburban sites all over the world. High levels of toxic (e.g.benzene) and reactive (e.g. isoprene) VOCs during winter has strongimplications for ambient air quality, formation of organic aerosol and ozone andradical budgets in the Kathmandu valley. Using the real time emission activity,mitigation strategies are proposed for reducing peak concentrations ofcarcinogenic compounds such as benzene.

P1.7 - PHOTOSENSITIZED CHEMISTRY AT THE AIR/SEA INTERFACE: A SOURCE OF FUNCTIONALIZED VOC AND AEROSOLS

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The sea surface is characterized by an organicenriched microlayer. Exposed to solar radiation, it has been demonstrated that thesurface is a source of volatile organic compounds (VOC) as well as highlyfunctionalized VOCs. Therefore, it is thought that photochemical processesoccurring at air-sea interface lead to the formation of low molecular weightorganic compounds able to condense, leading to SOA formation and growth.

The aim of this study is centred to the followingquestion: can photo-induced chemical processes under relevant atmosphericconditions lead to the aerosol loading in the marine boundary layer? Previousworks have shown that photochemical processing led to the formation of highlyfunctionalized VOCs which may be potential candidates to the SOA loading. Inorder to bring further comprehension, a multiphase atmospheric simulationchamber has been developed and used in order to study the chemical processes occurringat the air-sea interface. The chamber is made of 2 m3 FEP film inwhich a glass container is inserted. Formation of particles has been initiatedthrough the VUV irradiation (centred at 365 nm) of a liquid mixture of humicacid used as photosensitizer and nonanoic acid as a surfactant. Particleformation was measured using an ultrafine condensation particle counter (d50> 2.5 nm) and particle growth was monitored using SMPS. VOCs formed havebeen identified and analysed by Proton Transfer Reaction – Time of Flight massSpectrometer and GC/MS. The chamber is also equipped with continuouslymeasuring NO-NOX, SO2, ozone and CO. In addition, analysisof liquid content was performed using an Orbitrap LC/MS. Liquid mixture isexposed to irradiation for more than 10 hours.

Under our experimental conditions, particle numberconcentration increased after 10 min of irradiation up to 5000 cm-3.It has been also observed that the aerosol number concentration decay was notlogarithmic showing the occurrence of another nucleation episode. Particle sizedistribution was measured 4 hours after starting irradiation. At the end of theexperiments, ozone was added in the dark and particle formation was observed,sustaining the presence of SOA precursors among the VOCs formed during irradiation.In addition, orbitrap analysis of the liquid content has shown clearly thepresence of unsaturated aldehydes (C5-C8). Particle formation linked to the gasphase properties as well as with the liquid content will be presented.Atmospheric implication of photosentized reactions as a source of SOA loadingin the marine boundary layer will be discussed.

P1.8 - BIOMASS BURNING IN EAST ASIA AFFECTS ANHYDROSUGARS IN AEROSOLS AT OKINAWA IN THE WESTERN NORTH PACIFIC

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Biomass burning largely contributes to chemical compositions of atmospheric aerosols. Aerosol samples (TSP) were collected at Cape Hedo, subtropical Okinawa Island in October 2009 to February 2012 and analyzed for anhydrosugars as tracers of biomass burning. Levoglucosan was detected as the dominant anhydrosugar followed by its isomers: mannosan and galactosan. We found a clear seasonal trend for levoglucosan and mannosan with winter maxima and summer minima. Positive relation was found between levoglucosan with nss-K+ (Pearson correlation, $r = 0.38$, $p < 0.001$), which confirmed their sources from biomass burning. Air mass trajectories and fire spots indicated that the seasonal variations of anhydrsosugsars were related to the long-range transport of biomass burning emissions from the Asian Continent. The monthly variations of levoglucosan/mannosan (L/M) ratio from 2.1–4.8 in May–June to 13.3–13.9 in November–December, suggesting that the burning substrates are changing depending on seasons and air mass origins. Total carbons in anhydrosugars contributed 0.22% and 0.13% to water-soluble organic carbon (WSOC) and total organic carbon (OC), respectively. We found the highest contributions of anhydrosugars to WSOC (0.37%) and OC (0.25%) in winter, indicating a strong effect of biomass burnings on regional air quality. Two event analyses for high abundances of anhydrosugars indicated a long-range transport of open burning and domestic heating emissions from northern and northeastern China, Mongolia, and Russia over the sampling site in Okinawa. These results provide the information to better understand the effect of biomass burning on regional air quality in East Asia.

P1.9 - SESQUITERPENE EMISSION, CONCENTRATION AND REACTIVITY IN A BOREAL FOREST

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Sesquiterpenesare important for atmospheric chemistry, since they influence theoxidation capacity and contribute to secondary organic aerosol (SOA)mass. Though most attention has been on monoterpene and isopreneoxidation products when investigating SOA, studies show that newparticle formation in rural areas is most likely initiated byreactions of sesquiterpenes and ozone. Due to the high reactivity,and therefore short life time of sesquiterpenes, their ambientconcentration has been poorly quantified. Here we present modeledreactive sesquiterpene emissions and concentrations together withtheir alteration of the atmospheric oxidation budget, predicted bythe detailed 1D chemistry transport model SOSAA (Boy et al., ACP,2011). The study was carried out over a Scots pine forest at theSMEAR II station in Finland. The concentrations of ß-caryophylleneand a-farnesene, which are the most abundant sesquiterpenes at SMEARII (based on the emission measurements), have never been measuredthere due to their high reactivity. Instead Hakola et al. (ACP, 2012)measured less reactive sesquiterpenes during one year using GasChromatography – Mass Spectrometry. Our sensitivity studies showthat due to their short life time, the daily modeled concentrationpattern for the very reactive sesquiterpenes is independent ofwhether the emissions are modeled as mostly light or temperaturedependent. A daytime concentration peak is modeled for the veryreactive sesquiterpenes, which is the opposite as for themeasurements of the less reactive sesquiterpenes. Following this, wesimulate the highest ratio of sesquiterpene concentration compared tothe total monoterpene concentration with a ratio of ~0.2% duringdaytime. Further, we simulate a higher total night time concentrationof sesquiterpenes than of isoprene. Thelife time of the sesquiterpenes is too short for the meteorology tohave much influence on their spacial distribution, why theconcentration peak is found within the tree crown and follows thatthe concentration is insignificant outside the tree crown. Thecontribution to the total OH-reactivity due to reactions with thereactive sesquiterpenes is insignificant. The reactive sesquiterpenescontribute evenly with the monoterpenes to the O3-reactivity, butonly around 50% to the NO3-reactivity compared with the monoterpenes.

P1.10 - EMISSIONS OF TERPENOIDS, BENZENOIDS, AND OTHER BIOGENIC GAS -PHASE ORGANIC COMPOUNDS FROM AGRICULTURAL CROPS AND THEIR POTENTIAL IMPLICATIONS FOR AIR QUALITY

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Agriculture comprises a substantial fractionof land cover in many regions of the world and may increase with future landuse changes. Emissions from agricultural vegetation and otherbiogenic and anthropogenic sources react in the atmosphere to produce ozoneand secondary organic aerosol, which comprises a substantial fraction of PM2.5.Using data from three measurement campaigns, we examine emissions ofreactive gas-phase organic carbon from agricultural crops and their potentialto impact regional air quality

relative to anthropogenic emissions from motorvehicles in California's San Joaquin Valley, which is out of compliance withstate and federal standards for tropospheric ozone and particulate matter (PM2.5). Emission rates fora suite of biogenic terpenoid compounds were measured in agreenhouse for 25 representative crops from California in 2008, andambient measurements of terpenoids and other biogenic compounds in the volatileand intermediate-volatility organic compound range were made over an orangeorchard in a rural area of the San Joaquin Valley during two seasons in 2010:summer and spring flowering. We combined measurements from the site with ozone modeling methods to assessthe net effect of the orange trees on regional ozone. When accounting for bothemissions of reactive precursors and the deposition of ozone to the orchard,the orange trees are a net source of ozone in the springtime during flowering,and relatively neutral for most of the summer until the fall when it becomes asink. Flowering was a major emission event and caused a large increase inemissions including a suite of compounds that had not been measured in theatmosphere before. Such biogenic emission events need to be betterparameterized in models as they have significant potential to impact regionalair quality since emissions increase by an order of magnitude. Inregions like the San Joaquin Valley, the mass of biogenic emissions fromagricultural crops during the summer (without flowering) and thepotential ozone and secondary organic aerosol formation from theseemissions are on the same order as anthropogenic emissions from motor vehiclesand must be considered in air quality models and secondary pollution controlstrategies.

P1.11 - AIR POLLUTION DISPERSION BY MESOSCALE CIRCULATIONS OVER THE METROPOLITAN AREA OF SÃO PAULO

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The problem of air pollution over megacities is very known and discussed all around the world. In particular over South America, the Metropolitan Area of São Paulo (MASP) poses an interesting problem to air pollution dispersion, since it has a large number of pollutant sources and it is located in a very complex terrain, with the most of its urban area surrounded by mountains, and very close to the Atlantic Ocean. In this work we will discuss some features related to the interaction of the urban heat island and the sea breeze in a selected number of days, identifying how these circulations act during severe air pollution cases, contributing for both, increasing or decreasing of the concentration of the main pollutants over the MASP. Situations of severe weather conditions favorable for the processes of pollution washout will be also discussed. The results will be based on surface observations and numerical modeling analysis and forecasts in a very high resolution, made operationally at the IAG-USP.

P1.12 - INDIVIDUAL MARINE AEROSOL PARTICLES FROM THE HIGH ARCTIC INVESTIGATED BY SCANNING ELECTRON MICROSCOPY AND FOURIER TRANSFORM INFRARED NANOSPECTROSCOPY

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Aerosolparticles and cloud formation are still poorly represented in global climatemodels and one reason for large uncertainties in the projections of futureclimate. To improve the number of observations and to better understand theprocesses contributing to the formation of marine low-level clouds, aerosolparticles were collected under remote and pristine conditions during the ASCOS(Arctic Summer Ocean Cloud Study) 2008 expediton to the high Arctic.

Aerosolparticles were sampled onto Transmission Electron Microscopy (TEM) Formvar-grids, enabling electron microscopy, Energy Dispersive X-ray (EDX) spectroscopyand Fourier transform infrared (FTIR) nanospectroscopy on individual aerosolparticles. Size distributions and morphological properties of the aerosolparticles were assessed by Scanning Electron Microscopy (SEM) down to adiameter of 15 nm. FTIR nanospectroscopy onindividual aerosol particles allowed the identification of organic componentsof the aerosol particles.

Comparingthe size distributions with simultaneous Tandem Differential Mobility ParticleSizer (TDMPS) measurements confirmed capturing of a representative fraction ofthe aerosol particles with SEM. The size distributions show the typical bimodalstructure of marine aerosols. Goodagreement between SEM andTDMPS was obtained in the Aitken mode; in the accumulation mode the sizing is critically dependent on thecontrast of the aerosol particles with the background and probable changes ofthe aerosol appearance due to the impaction onto the TEM grid.

Three morphologically different types ofaerosol particles were observed: single particles (SP), gel particles (GP) andhalo particles (HP). SP occur over the whole size range, whereas GP appear >40mn and HP >60 nm. Very electron dense entities within large GP have a meandiameter of 40 nm, suggesting the disassembly of marine gel particles intosmaller entities due to UV sensitivity. Morphological parameters (elongation,circularity) vary between aerosol samples and particles types pointing towardsan effect of the days the air-masses spent over the pack-ice before beingsampled.

Theresults of ongoing FTIR nanospectroscopy measurements on individual aerosolparticles from the ASCOS samples will be presented. Conventional FTIRabsorption spectra of gels from F. cylindrus will support band assignmentsin the FTIR nanoabsorption spectra.

P1.13 - NATURAL EMISSIONS IN THE BRAZILIAN AMAZON RAINFOREST: IMPACT ON THE OXIDATIVE CAPACITY OF THE ATMOSPHERE

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Terrestrial vegetation, especially tropical forests, releases large amounts of biogenic volatile organic compounds (BVOCs) into the atmosphere. The global emissions of BVOCs (1005 Tg C/year) are dominant in relation to anthropogenic volatile organic compounds (50-100 TgC/year). Tropical trees cover about 18% of the global land surface and are estimated to be responsible for 80% of terpenoid emissions and 50% of other VOCs emissions. Observational and modeling studies conducted in forest regions are helpful for an understanding of regional and global atmospheric chemistry, improving the prediction models for air quality, weather and climate. This study aims to obtain information on the chemical composition of the atmosphere of the Brazilian Amazon rainforest through observational measurements (air and surface) and the use of models MEGAN (Model of Emissions of Gases and Aerosols from Nature) and CCATT-BRAMS (Coupled Chemistry Aerosol Tracer Transport model coupled to Brazilian Regional Atmospheric Modeling System) to investigate the role of BVOCs, the oxidative capacity of the atmosphere and the controlling factors that alter the emissions of BVOCs. The SAMBBA (The South American Biomass Burning Analysis) experiment, which occurred during September 2012 in the Brazilian Amazon region, provided measures of chemistry/physics of the atmosphere from the aircraft (FAAM BAE-146), surface site in Porto Velho-RO (8°41'S, 63°52'W) and the observation tower k-34 (02°36'S, 60°12'W), northwest of Manaus-AM (3°06'S, 60°01'W). Numerical simulations will be conducted to focus on specific flights (biogenic- flight B735; human disturbance - flight B737 "flaming phase" and B739"smoldering phase") that address the purpose of this research, and with the data obtained from the respective flights serving as a parameter in the numerical simulations. This study has a synergistic approach between observation and modeling, using a 3D numerical model of chemical transport (CCATT-BRAMS) coupled to a natural emission model (MEGAN) to study the BVOCs in the Amazon rainforest, with the goal of developing a numerical model that incorporates the understanding needed to represent observations. The SAMBBA experiment provided valuable database that is being included into a numerical model of air quality, offering a unique opportunity to advance our knowledge of the Earth system.

P1.14 - VOC-MEASUREMENTS AT RIVERSIDE-BASED TIWA HOTEL IN THE VICINITY OF MANAUS – AM (BRASIL)

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Voc-measurements at riverside-based TIWA hotel in the vicinity of Manaus – AM (Brasil)

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The Amazon is emitting huge amounts of biogenic vocs. After realease they undergo different reaction schemes, alterations and participate in particulate matter. Besides, human agglomerations like the city of Manaus severely alter the voc budget and initiate massive ozone formation.

To understand and quantify the interaction of an antropogenic disturbance in the voc budget, the photochemical reaction pathways and the ozone forming potential, new longterm measurements are run in and around Manaus in January 2014. These measurements are part of the Brazilian-USAmerican GoAmazon 2014 project.

We are presenting data from the measurements performed at Tiwa Hotel, west of Manaus. Since the easterly trade winds dominate the wind pattern, antropghenic emission from the city, mixing with biogenic emission from the forest, are present at the site.

To specify parts of the local VOC composition of the site, a PTR-MS was used alongside a set of gas-phase determination instruments, measuring O3, SO2, CO and other gas-phase species. The PTR-MS was used at 139 Td with a drift temperature of 60 deg C measuring at 6m height above ground level.

Averaged Isoprene levels were found to be 2,18+-0,42 ppb, 15:00 o'clock local time and correlated well with the levels of MVK+MACR values of 634+-254 ppt. This was found to be corresponding well to previous studies during wet season.

Toluene and Benzene show a clear diurnal pattern and were found to have a mean at 11:00 local time of 0.5+-0.4ppb and 0,19+-0,10 pbb respectively. As these are produced by combustion of fossil fuels, increasing levels are correlated with increasing black carbon levels and increasing particle counts at site.

The relation between ozone and Voc precursors has been investigated and is closely related but is minor to theoretical values. As reported earlier probably the full ozone generating potential is further downwind of Manaus.

P1.15 - DISPERSION MODELING OF VOLCANIC ASH CLOUDS: THE PUYEHUE–CORDÓN CAULLE ERUPTION IN JUNE 2011, AND ITS IMPACT IN SOUTH BRAZIL

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Volcanic eruptions can be a mode of particulate matter dispersal resultingin long-distance transport of pollutants through the atmosphere. The ability todetect these volcanic clouds using satellite remote sensing and predict theirmovement by dispersion modeling is a major component of hazard mitigation. The Puyehue–Cordón Caulle volcanic complex is located in the NorthernPatagonia (Chile) and is an active centre. A volcanic event started in the Puyehue–CordónCaulle complex in June 4, 2011 (19:15 UTC), dispersing ashes to the central andnorth areas of Argentina, Uruguay and the south of Brazil due to the West–East predominantwinds. The volcanic eruption lead to severe consequences in the economy a lifeof the nearby territories and the ash impacted on well-traveled commercialaircraft flight paths in Argentine, Uruguay and Brazil. The present study aimsto implement a model of transport of particulate matter through the movement ofair masses. The HYSPLIT (Hybrid Singled-Particle Lagrangian IntegratedTrajectory), which is a computational model that provides the trajectory and dispersionof pollutants entering or leaving a specific area, was used. Trajectories werecomputed using archived data from the Global Data Assimilation System (GDAS). Atotal of 192 simulations were performed beginning at 8:00 UTC of June 4, 2011,and finishing at 12:00 UTC of June 20, 2011. Satellite images (CPTEC-INPE,Brazil) showed that the volcanic ashes begun to be transported to the north ofthe South American continent on June 6 at 06:00 UTC. Those ashes originatedfrom that specific date and time reached the state of Rio Grande do Sul ataround 12:00 UTC on June 7. Such data obtained from satellite imagery arecompatible with the simulation performed at the same time, standing 48 h withan altitude of 11,000 m. According to these findings and literature data onatmospheric sciences, the HYSPLIT model can predict with acceptablereproducibility the transport of volcanic ashes and other particulate matter, andtherefore it can be used as a tool for atmospheric chemistry modeling.   Acknowledgments: NOAA, CNPq, CAPES, Graduate Program of Chemistry (UFRJ) References: HYSPLIT, Hybrid Singled-Particle Lagrangian Integrated Trajectory. Available in http://ready.arl.noaa.gov/HYSPLIT.php.

P1.16 - CHEMICAL CHARACTERISTICS OF FOG/CLOUD WATER IN A SUBTROPICAL FOREST

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Cloud water chemistry is directly affected by the properties of aerosol particles which acted as cloud condensation nuclei (CCN), as well as subsequent aqueous and multi -phase chemical reactions. Besides physical properties, such as particle size and shape, the chemical composition of aerosol particles strongly influences the extent to which atmospheric particles interact with water, thus determining their hygroscopicity and ability to act as CCN. Yet, few studies have investigated the role which organic compounds play in cloud-aerosol interactions, especially in form of ambient measurements in East and Southeast Asia.

This study was conducted at a forest site in central Taiwan, in order to investigate the chemical composition of both fog/cloud water and aerosol particles. Specifically, organic compounds derived from biological sources, such as fungal activities, and oxidation products of biogenic emissions, such as isoprene, were measured. The fog water and aerosol filter samples were analyzed by various techniques, including high-performance anion exchange chromatography (HPAEC).

Selected carbohydrate species were quantified and used as molecular tracers for biogenic source contributions, including fungal spores and secondary organic aerosol (SOA) from isoprene oxidation. The total amount of fungal spores was determined by flow cytometry and also estimated by the molecular tracer method. High concentrations of certain inorganic ions (ammonium and sulfate) were related to agricultural activities, which released CCN-active ionic species. In addition, high levels of the fungal tracers (arabitol, mannitol) and isoprene-derived SOA tracers (2-methyltetrols) were observed in the fog water samples, indicating important influence of these biogenic sources on fog water chemistry.

P1.17 - OZONE REACTIVITY MEASUREMENT FOR BIOGENIC VOLATILE ORGANIC COMPOUND (BVOC) EMISSIONS DURING THE SOUTHEAST OXIDANT AND AEROSOL STUDY (SOAS)

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Recent studies on atmospheric chemistry in the forest environment have shown that the total reactivity of emitted biogenic volatile organic compounds (BVOC) is still not well understood. During summer 2013, a comprehensive and intensive field campaign (Southeast Oxidant and Aerosol Study – SOAS) took place in Alabama, U.S.A. In this study, an ozone reactivity measurement system (ORMS) was deployed for the direct determination of the ozone reactivity of foliar emissions. The ORMS is a novel measurement approach, in which a known amount of ozone is added to the ozone-free air sample stream and then the ORMS measures the ozone concentration difference between before and after a glass flask flow tube reaction vessel (2-3 minutes of residence time). Emissions were also collected onto adsorbent cartridges to investigate the discrepancy between total ozone reactivity observation and reactivity calculated from identified BVOC. Leaf and canopy level experiments were conducted by deploying branch enclosures on the three dominant tree species at the site (i.e. liquidambar, white oak, loblolly pine) and by sampling ambient air above the forest canopy. For the branch enclosure experiments, BVOC emissions were sampled from a 70 L Teflon bag enclosure, purged with air scrubbed for ozone and nitrogen oxides. Each branch experiment was performed for 3-5 days to collect data for at least two full diurnal cycles. In addition, BVOCs were sampled using glass tube cartridges for 2 hours during daytime and 3 - 4 hours at night. During the last week of the campaign, the inlet for the ORMS was installed on the top of a scaffolding tower (~30m height). The ozone loss in the reactor revealed a distinct diurnal cycle for all three tree species investigated, and ozone reactivity followed patterns of temperature and light intensity. From the ambient measurement on July 8, 0.8-1.3 hour-1 of ozone reactivity (i.e. equivalent to an ozone lifetime of 0.8-1.3 hour) was observed during daytime.

P1.18 - VARIABILITY OF TROPOSPHERIC OZONE IN A POLLUTED MARINE ENVIRONMENT

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Tropospheric ozone (O3) is an important gas for the atmospheric oxidative capacity as well a threat to human health. Furthermore, it contributes to a radiative forcing of 0.40 ± 0.20 W m–2(IPCC AR5). The cycling of O3 depends on the interplay between nitrogen oxides (NOx, e.g. NO & NO2) and volatile organic carbon (VOC). In marine areas, reactive halogen species can be released from sea salt aerosol which stem from bubble bursting and wave breaking and strongly influence O3 levels.

Here, we present a two year time series from 2011-2012 of O3, NO2, NO, and aerosol properties from a coastal city in the southwest UK (Plymouth), along with O3 at a nearby coastal headland (Rame Head). During offshore winds, on average ozone levels were fairly constant around dawn and then increased slightly throughout the day at the coast, probably due to NOx and VOC chemistry. In the city center, ozone decreased within the first 3 hours after dawn, followed by a more pronounced increase. During onshore winds , however, rapid ozone depletion started even 2 hours before sunrise at Rame Head and in the city center, respectively.

The difference in O3 depletion in the two cases cannot be simply explained by NOx alone. The strong winds in the area and the observed high loading of sea salt aerosols suggest possible halogen emissions, which in a polluted environment may be promoted by the presence of NOx due to acidification of the aerosol. This effect may be of global relevance, since 20% of the world’s population lives within 30km of the coast. The effect of the boundary layer height and local emission sources, as well as seasonal effects are investigated. We explore the magnitude of O3depletion by halogens using a detailed photochemical box model, which includes detailed chemistry in the gas and particulate phase as well as microphysical properties.

P1.19 - PHOSPHORUS SPECIATION IN ATMOSPHERIC DEPOSITION SAMPLES IN THE EASTERN MEDITERRANEAN: FLUXES, ORIGIN AND BIOGEOCHEMICAL IMPLICATIONS.

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The Mediterranean Sea has one of the most oligotrophic surface waters in the worldwith Low Nutrient and Low Chlorophyll. The deep water of the East MediterraneanSea has a uniquely high DIN/DIP ratio raging from 25 to 28, compared to the Western Mediterranean (22) and the “normal” oceanic Redfield ratio of 16 (Krom et al., 1991). The primary productivityin the Eastern basin is phosphorus limited and new knowledge could be arisen by defining the role of organic and inorganic forms of atmospheric deposited P.

The speciation of P in depositionsamples (rain & dry) was determined according to the analytical protocolreferred in Standard Methods for the Examination of Water and Wastewater (20thEdition). Total Phosphorus (TP) in both soluble and insoluble matter wasmeasured after acid digestion of samples according to Persulfate DigestionMethod; TP was measured colorimetrically as PO43- at690nm using the stannus chloride method. TP recoveries obtained with the use ofcertified reference materials (MESS-3) were found to be to 98±12%. DissolvedPhosphate (DIP) was determined as HPO42- by AnionChromatography (IC), while Total acid hydrolized Inorganic Phosphorous (TIP)was determined after mild oxidation of sample (pH=1.6) with sulfuric acid(0.02M), separately in filtrate and filterable sample. Organically boundphosphates were determined in both soluble (DOP) and insoluble matter (POP) bysubtracting TIP from TP, while the condensed phosphates (pyro-, meta-, andother polyphosphates), called CP, were determined only in the soluble fractionby subtracting HPO42- from soluble TIP. In selected samples P speciation was alsoconducted using novel synchrotron-based techniques (P-NEXFS) providing valuable insights into thecomposition and therefore the factors influencing the solubility andbioavailability of phosphorus in deposition samples.

A total of 43 rain events were collected overtwo years period (2012-2013) at Finokalia (Crete). Significant was found thecontribution of organic P species both in soluble and insoluble fraction of wetdeposition with percentage contribution of 86% and 62%, respectively. Significant wasthe phosphorus in dry deposition since the average percentage contribution of dry deposited TP during both years (n=73) was estimated 57% of total deposition.

P1.20 - NUTRIENT CYCLING IN RAINFALL, THROUGHFALL AND STEMFLOW IN AN BRAZILIAN SEMIARID REGION

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Precipitation brings nutrient from atmosphere to the ground scavenging them from the atmosphere column. Furthermore, throughfall washout material deposited on plant tissues as well as leachates exudated products resulting in changes in the rainwater chemistry. The inputs of nutrients into the soil through such processes are important for nutrient recycling and it depends intimately on the hydrological characteristics of the environment. Environments with low water availability and high temporal and spatial variability like arid and semiarid environments, these relationships are poorly understood. For instance, in some years, rainfall events are regular but in some years, it can delay or even not occur. The knowledge of these consequences of this hydro-climatic pattern on nutrient cycling is still scarce. The major goal of this research is to assess the water and nutrient transport between atmosphere and soil in a typical Caatinga vegetation and in a pasture. Nevertheless, herewe present only the comparisons of: (a) the amount of rainfall that reaches the soil as throughfall and as stemflow, and (b) the rainwater, throughfall and stemflow chemical composition, among years with different precipitation rates in the Brazilian semiarid. Samplings were collected during the rainy season in the semiarid region of Pernambuco State, in the northeast of Brazil (8°52’30”S, 36°22’00”W). Rainwater, throughfall and stemflow were sampled in triplicate, once a week, from April to August in 2012 and 2013, resulting in an amount of 30 sets of samples.The chemical analyzes are still being processed in order to determine their major cations and anions concentrations, total dissolved carbon, total organic carbon, total nitrogen, alkalinity and pH. The observed precipitation represented about 40% and 50% of the historical mean precipitation, in 2012 and 2013, respectively. Of the total rainfall, 66% reached the soil as through fall in 2012 and 75% in 2013. In semiarid vegetation the mean throughfall is about 49%, with a variation coefficient of ±32%, so the observed data are consistent with those reported in the literature. At the end of this research we will contribute to the knowledge of rainwater quality and biogeochemical cycling in semiarid regions.

P1.21 - CHANGES IN LAND USE AND EMISSIONS OF GREENHOUSE GASES IN THE SEMIARID NORTHEAST, PERNAMBUCO, BRAZIL

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A Caatinga, um bioma exclusivamente brasileiro, abrange cerca de 11% do território, e possui uma riqueza de biodiversidade e endemismo. É uma região marcada por uma história de secas, com efeitos sobre a população, com ênfase sobre a pobreza. A irregularidade nos níveis de precipitação e mudanças no uso da terra representam um agravamento de um cenário futuro de desertificação na região. Além disso, esse bioma tem experimentado um processo de substituição da vegetação nativa em pastagens e agricultura, que contribui para esse cenário. Este estudo teve como objetivo quantificar os fluxos de dióxido de três principais gases de efeito estufa de carbono (CO 2), metano (CH 4) e óxido nitroso (N 2 O), referente a mudanças no uso da terra (LUC) durante as estações seca e chuvosa no município de São João , Estado de Pernambuco, usando o método da câmara estática . O projeto deste experimento consistiu de dois tratamentos: Native Vegetation-Caatinga (C) e pastagem (P), divididos em três blocos (repetições) por tratamento. Os CO 2 fluxos foram maiores durante a estação seca (One-way ANOVA, p = 0,000), com os mais elevados de emissões encontrados no pasto (4,6 gm -2 d -1) ea menor na Caatinga (3,2 gm -2 d - 1). Na estação das chuvas, não houve diferença entre os tratamentos, e CO 2 fluxos em Caatinga e Pastagem foram, respectivamente, 3,4 g m^2 d -1 3,6 mg e -2 d -1 . Alta N 2 O emissões foram encontrados durante a estação seca (One-way ANOVA, p = 0,000), e os maiores emissões foram encontrados em pastagem (0,66 mg m^2 d - 1) ea menor na Caatinga (0,33 mg m^2 d -1). Durante a estação das chuvas, não houve diferença significativa entre os tratamentos, e os fluxos foram 0,03 mg m^2 d -1 no pasto e 0,01 mg m -2 d -1 na Caatinga. Não houve diferença significativa entre os fluxos de CH 4 a tratamentos ou temporadas. Durante a estação seca, as temperaturas do solo atingiram 31,3 ° C o que era 17% mais elevada do que a temperatura medida na estação chuvosa (24,5 ° C). Estes resultados preliminares sugerem uma possível tendência de aumento de CO 2 e N 2 O por elevação da temperatura, que é fortemente influenciado por mudanças na cobertura da terra no bioma.

P1.22 - GENES ENCONDING CLIMATE CHANGE

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Metagenomics is a strategy that allows access to the genomic potential of environmental samples by extraction of total DNA in the sample. Within this idea, it is possible to search the existence of genes encoding the enzyme DMSP lyase which is involved in the hydrolisis of dimethyl sulfonyl propionate (DMSP) to dimethyl sulfide (DMS) that plays an important role in the cycle sulfur, thereby helping the production of clouds in a given region. Genes encoding this enzyme are called Ddd family including dmdA, dddD, dddL, dddQ, dddW and dddY genes. The CLAW hypothesis explains that the DMS is responsible for climate change in some regions of the planet and its production may be influenced by salinity, low temperature, variation of light and nutrient limitation. The

Northeast region of Brazil suffers greatly with rainfall shortage, which causes decreased levels of the rivers that reflects the production of meat and food. Seeking to understand the relationship of microbial diversity and dmdA genes it has being extracted DNA from soil by metagenomics techniques. It has being colected soil samples from three regions of Mossoro (RN - Brazil). The first, near Rio Apodi-Mossoro (place of higher vegetation - two samples); the second, in the district Aeroporto in Mossoro (place with less vegetation - two samples); the third, near the town of Areia Branca (region of higher salinity - two samples). The trials of gene amplification of genes dmdA of two and six samples are already underway. The samples in which amplification has been performed, the DNA appeared cleanly, a single band with no degradation to the electrophoresis gel. By the time, it was built the first metagenomic library successfully. Amplification of specific genes will be performed on all samples, including electrophoresis and purification of the products for subsequent transformation into competent cells.

P1.23 - INTEGRATION OF C1, C2,3, AND C5 METABOLISM IN TREES

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C1 metabolism inplants is potentially involved in a large number of central metabolic processesincluding C2 photorespiration, C3 photosynthesis,nitrogen and amino acid metabolism, as well as the methylation and biosynthesisof metabolites and biopolymers. Although the flux of carbon through the C1pathway is thought to be large, its intermediates are extremely difficult tomeasure and relatively little is known about this potentially ubiquitous, yetmysterious pathway. While methanol production and emissions from plants to theatmosphere is generally considered to be only a byproduct of cell wallexpansion in growing leaves and degradation in stressed and senescing leaves,we demonstrate that it initiates the C1 metabolicpathway in plants which is tightly integrated with C2,3and C5 metabolism. Delivery of [13C]methanol and [13C]formaldehydesolutions to detached branches of the tropical tree species Inga through thetranspiration stream rapidly stimulated the emissions of C1 ([13C]methanol,[13C]formaldehyde, [13C] formic acid, [13C]CO2),C2 ([13C1-2]acetic acid, [13C1-3]methylacetate), and C5 ([13C1-2]isoprene). Deliveryof [2-13C]glycine and [13C]formate solutions stimulatedemissions of C1 ([13C]formic acid and [13C]CO2),C2 ([13C1]acetic acid, [13C1]methylacetate), and C5 ([13C1-5]isoprene). Upontransition into [13C]methanol or [13C]formaldehyde,acetic acid emissions were replaced by [13C1]acetic acidwhich were rapidly replaced by [13C2] acetic acid. Thisemission pattern was reversed upon transitioning back into non-labeled methanolor formaldehyde and suggests a strong labeling of some leaf acetate and acetylCoA pools. While the labeling dynamics of the acetate group of methyl acetatereflected that of acetic acid, strong 13C-labeling of the methoxygroup was observed under [13C]methanol. These observationsdemonstrate that methyl acetate derives from the acetylation of methanol byacetyl CoA, thereby further integrating C1 and C2,3metabolic processes. High vertically resolved ambient air gradients of methylacetate within and above a primary tropical rainforest in the central Amazonprovides direct evidence that forested ecosystems can be a net source of thisreactive ester to the atmosphere. Our study provides the first evidence for astrong coupling between C1, photorespiratory (C2), Calvincycle (C3), and the isoprenoid (C5) pathways offeringplants flexible metabolic payoffs for their investments into cell wallmethylation. We suggest that the integration of C1 and C2,3metabolism in plants may reduce the loss of carbon and nitrogen underphotorespiratory conditions by reducing glycine decarboxylations. Thus, our observations have important implications forunderstanding the integration of cellular, whole plant, and ecosystemmetabolism.

P1.25 - AEROSOL OPTICAL PROPERTIES, DOWNWARD SOLAR IRRADIANCE AND OZONE CONCENTRATIONS MEASURED AT HUMAITÁ, AM, DURING THE BIOMASS BURNING SEASON OF 2012

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During the dry season of 2012, a fieldexperiment was conducted around Humaitá, AM (7.52° S, 63.03° W), from August 15to October 2 aiming to study vertical profile of photosynthetically activeradiation (PAR) and ozone concentration diurnal cycle inside primary forestcanopy. The main instrumentation was mounted on a micrometeorological towerlocated in a primary rainforest site, about 23 km northeast from theFederal University of Amazonas (UFAM), Humaitá campus, located downtown, wherethe other part was set up. At the tower, vertical profile of PAR was performedat five levels inside the canopy, from the top, at about 33 meters down to 5meters from the ground. One ozone monitor from 2BTech was set up inside thecanopy at about 25 meters from the ground. Another similar instrument was setup at the top of a building at UFAM. At this site, one Multi-Filter RotatingShadowband Radiometer was run, to retrieve aerosol optical depth (AOD) anddownward diffuse and global total solar irradiance. In this presentation, resultsfrom this field experiment will be discussed. Peak ozone concentration above50 ppb was measured at both sites. Daily mean aerosol optical depth valueranged from about 0.1, under clean conditions, to 1.0 at 550 nm during smokeevents. At solar noon, a 17% decrease of solar global irradiance was observedas AOD reached 1.0 at 550nm compared to a clean scenario. On the other hand,diffuse irradiance increased from about 55 Wm-2 to 290 Wm-2.The observed reduction in solar global irradiance wassimulate accurately only when smoke particles intensive properties, nominally lowersingle scattering albedo, was adjust to those typical of particles producedduring flaming phase of biomass burning emissions.

P1.26 - NEUROPOGON AURANTIACO-ATER AS BIOMONITOR OF AIR QUALITY OF FILDES PENINSULA, KING GEORGE ISLAND, ANTARCTIC PENINSULA

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Antarctica is a natural laboratoryof research because of its climate, geography, flora and fauna, and the conservation of their environment is monitored through the Madrid Protocol; however there are local pollution problems associatedmainly to human activities like research, tourism and fishing; inparticular, there are negative impactsto air quality fromthe use of fossil fuels. Inpractice, the performance of a collection campaign in remote sites presentsdifficulties. Access, continuity of sampling, and availability of power tooperate the sampling equipment are all major challenges. This explains whysignificantly fewer studies are done on Antarctic aerosols as compared withsimilar ones from urban sites.

The objective of this study is to evaluatethe evolution of air quality by elements in theFildes Peninsula, King George Island,Antarctica, between 1997 and 2010,using as biomonitor the lichen Usnea aurantiaco-ater the years 1997, 2006, 2008 and 2010. In order to betterdefine the absontion way of elements by lichen, 10 samplingpoints of Antarctic soils coming from a georeferencedarea were sampled the years 1997 and 2006. Lichens and soilswere digested with an acid mixture(USEPA method 3052)and Ag, Al, As, B, Ba, Be, Cd,Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Se, V y Zn were quantified by ICP-OES. Foreach sample duplicate;blanksand standards were performed using the reference material No. 482, CommunityBureau of Reference (BCR),Commission of the European Communities,was performed

Maps of elemental concentrations in lichens were developed usingthe ArcGIS 9.3 program and Enrichment factors (EF) were calculated. The results obtained forFE> 10 show an anthropogenic origin for the elements Mo, Ni, Pb and Zn. The maximum concentration of Mo in lichens is greater than that recommended by the USDA Forest Service [1] Usnea spp forair quality. The maps show differences of elemental concentrations closeto the scientific bases, theairport and the Collins glacier, linked to itspotential sources.

[1] USDA Forest Service, 2010.National Lichens & Air Quality.http://gis.nacse.org> [2012].

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P1.27 - CHARACTERISING EMISSION RATIOS OF TRACE GASES FROM AUSTRALIAN BUSH FIRES

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The Australian warmclimate triggers frequent wildfires from October to March in the southern part,and savannah fires from March to November in the northern part of thecontinent. Australian forest fires account for only for a small proportion ofthe area burned each year. Despite this the very large fuel loads andcombustion efficiency result in large emissions of toxics (H2CO, Hg,etc...) and greenhouse gases (CO2, CO, CH4, etc...) inour atmosphere. Australian annual emissions of total carbon from firesare similar to emissions from burning of fossil fuels.Safeways for the scientific community in Australia to study those bush fires upclose are prescribed fires and laboratory facilities (such as the Pyrotron inCanberra) designed to study fire combustion. Inthis poster, we report Open Path FTIR measurements for online characterisation and quantification of trace gases in the smoke from Australian eucalypt fires.

P1.28 - DIRECT MEASUREMENTS OF AIR-SEA VOLATILE ORGANIC CARBON TRANSPORT

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Oxygenated VolatileOrganic Compounds (OVOCs) in the atmosphere affect the tropospheric oxidativecapacity due to their ubiquitous abundance and relatively high reactivitytowards the hydroxyal radical. Thesecompounds may be emitted from or deposited to the surface ocean, the rate ofwhich is significantly controlled by airside resistance due to their highsolubility. Here we present air-seaflux measurements of three of the most abundant OVOCs – methanol, acetone, andacetaldehyde, by the eddy covariance technique from two recent cruises in theAtlantic.

Atmospheric OVOC concentrations were quantified by a high resolution proton-reaction-transfermass spectrometer (PTR-MS) with isotopically labeled standards at frequencies >2Hz. Dissolved concentrations ofOVOCs near the surface were measured twice-a-day using the same PTR-MS coupledto a silicone membrane equilibrator. This enables a direct comparison between fluxes measured by eddycovariance and predicted using the two-layer gas exchange model, as well as theverification of the air phase gas transfer velocity in the wind speed range of1~25 m/s. Methanol flux wasconsistently from the atmosphere to the ocean, while acetone varied fromundersaturation (influx) in higher latitudes to supersaturation (efflux) in thesubtropics of the N. Atlantic. Air/seaconcentration measurements indicate significant supersaturation of acetaldehydethrough out the Atlantic; yet the covariance flux was near zero. We discuss the oceanic cycling of theseOVOCs and evaluate their fluxes in the context of air-sea total volatileorganic carbon transport.

P1.29 - TRANSFORMATION OF ASIAN DUST PARTICLES OVER THE CENTRAL NORTH PACIFIC

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Aeolian dust and gaseous and particulate pollutants from the Asian continent are transported eastward over the North Pacific, especially in spring. Episodic atmospheric deposition of natural and anthropogenic aerosols containing iron and other essential trace elements may cause changes in primary productivity of phytoplankton, food web structure and chemical properties of marine atmosphere in the region. During the leg 2 of the R/V Hakuho Maru KH-12-1 cruise from Honolulu to Tokyo in the North Pacific (22 February – 7 March 2012), we conducted atmospheric measurements of aerosol and gaseous components with other meteorological and physical parameters on shipboard. Ambient aerosols segregated into two size fractions (d<2.5 μm and d>2.5 μm) were collected for 24 hours on a PTFE fiber filter by using a high-volume dichotomous virtual impactor air sampler with a wind sector control. Aerosol samples were analyzed by ion chromatography for major water soluble ions. Single–particle size and composition ranged between 0.1 and 2.0 μm were simultaneously measured by individual particle analy-

sis using an Aerosol–Time–Of–Flight Mass Spectrometer (ATOFMS) and clarified certain aerosol types, such as biomass burning, elemental carbon, and elemental/organic carbon mixed type in the North Pacific. Increased non-sea-salt (nss)-Ca concentration as one of indicators of mineral dust followed by the increased nitrate and ammonium concentrations were observed at 4,000-6,000km east from the Asian continent on 27-29 February. It is clearly shown the long rang transport of natural mineral dust and anthropogenic substances to the central North Pacific. By the single particle analysis, mineral dust particles were mixed with sea salt and <0.7μm and >0.7μm dust particles were associated with sea salt approximately 20% and 50% by number, respectively. This coagulation process between mineral dust and sea salt particles may accelerate the gravitational setting of marine aerosols and supplies the terrestrial, marine, and marine biogenic origin substances to the ocean environment.

P1.30 - CHEMICAL COMPOSITION AND SOURCES OF ATMOSPHERIC AEROSOLS AT DJOUGOU (BENIN)

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In the framework of the IDAF* program, long term measurements ofatmospheric aerosols chemical composition were carried out from 2005 to 2009 atDjougou in Benin. Djougou is a rural zone representative of a woodyand shrubsavannah ecosystem. The site is characterized by asudanese climate type (dry season: November to April; wet season: May toOctober).

This study presents a 4 years original database on the elementary chemistrycomposition of aerosols (carbonaceous species, ions and traces elements). Aweekly collection was performed on filters through an air inlet at 5l/mn with asize segregation, i.e, PM 2.5 and PM 10. The main objectives of this work are(1) to document the physico-chemical characteristics of the aerosols (2) toanalyze seasonal and interannual variations of the aerosol composition (3) todefine the potential emissions sources and the climatological factors influencingthe measured chemical composition.

The main constituents of the aerosols collected in Benin areAl, Fe, OC, BC, $Ca^{2}+$, NO3-, $SO4^{2}-$ andNH4+. We have identified four main groups of compounds related tosources of interest: dust, POM, BC, ions. On an annual basis, the peakof mass concentration for both sizes was registered during the dry season. Massconcentration represents 67±2% to 87±10% in the dry season versus 13±10% to32±3% in wet season of the annual mass concentration for the four groups. Thesevalues emphasized the seasonality of the emissions and the relative weakstandard deviation indicates the low interannual variability. At the seasonal scale,major contributions to the aerosol chemistry in the dry season are: dusts (24-68%),POM (24-59%), BC (4-13%) and ions (2-5%) in both sizes suggesting apredominance of sahelian and Saharan dust emissions and biomass burning sourcein this season. In the wet season, the POM are predominant, followed by dusts, BCand ions in both sizes. This result point out the importance of biofuelcombustion used for cooking and heating and biogenic emissions.

P1.31 - BOTTOM-UP CONSTRAINTS ON REACTIVE NITROGEN EMISSIONS FROM BIOMASS BURNING

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Biomass burning is an important contributor to global totalemissions of reactive nitrogen (Nr). Generally, fire Nr emissions are calculated by multiplyingfuel consumption estimates (or a proxy, such as AOD) with static biome specificemission factors, defined in units of grams of individual Nr speciesper kilogram of dry matter consumed. Emission factors are a significant source of uncertainty in quantifying fireNr emissions because few observations outside of the laboratory thatconsistently sample all Nr species are available to characterize thelarge spatial and temporal variability of burning conditions. Thus, more insight into the role of biomassburning in the global cycling of nitrogen is needed. In this work, we combined estimates of fuelload derived by the CASA biogeochemical model (Carnegie-Ames-Stanford-Approach)and MODIS observed burned area, with detailed fuel type specific inventories ofplant nitrogen content derived from the ecology literature to calculate globalbiomass burning total N emissions and the fractionation between N2and Nr. In general, tropicalforest and savanna burning total N emissions from this work differed by as muchas 50% from current estimates derived from emission factors. Using our bottom up results and satellitebased estimates of NOx emission factors, derived from NO2tropospheric column observations, we calculated updated emission factors for NH3,the other major biomass burning Nr species.

P1.32 - AN ASSESSMENT OF PRECIPITATION CHEMISTRY AT THE SOUTH AFRICAN DEBITS SITES

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The precipitation chemistry of rain water presents a general overview of changes in atmospheric composition due to various factorsthat include anthropogenic activities, as well as changes in meteorology and climate. In this paper the chemistry for rain samples collected for 2009 – 2013 at four South African DEBITS (Depositionof Biogeochemical Important Trace Species) sites, i.e. Amersfoort (AF), LouisTrichardt (LT), Skukuza (SK) and the Vaal Triangle (VT) are presented and discussed, as well as compared to previous precipitation chemistry studies conducted at South African DEBITS sites. Rain water samples were collected on an event basis with automated wet-only samplers and analysed with ion chromatography.

The annual volume weighted mean (VWM) and wet deposition (WD) revealed higher concentrations of anthropogenically associated species at the anthropogenically impacted sites VT and AF, compared to the remote sites SK and LT. The concentrations of species for marine sources were higher at SK and LT. An overall increase of WD values of species associated with anthropogenic activities in South Africa, i.e. SO42-,NO3- and NH4+ was observed at all the sites compared to previous precipitation chemistry studies conducted at LT, AFand SK, which was ascribed to the increase in anthropogenic activities in SouthAfrica. Concurrently, a decrease in average pH is observed at all the sites that reflected a shift to more acidic rain events.

In addition to conventional empirical procedures usually applied to rain water events to determine source groups that contribute to the observed chemical composition of rain events, statistical analysis, i.e.principal component analysis and clustering were also performed to identify possible source groups. The three main source groups determined were marine, terrigenous and anthropogenic, which was indicated by the empirical and statistical methods. The most significant deduction that can be made from the results is a significant increase in the anthropogenic contribution to precipitation chemistry, which is strongly correlated to the increase in energy demand in South Africa.

P1.33 - CLIMATE VARIABILITY AND CARDIOVASCULAR DISEASE MORTALITY IN ELDERLY IN THE MATO GROSSO CITIES

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Introduction: The climate variability has beenlinked to exacerbation of cases of cardiovascular disease. In the region of thearc of deforestation of the Brazilian Amazon is observed increased mortalityduring the dry season, mainly due to intense fires in the region. Objective: Toanalyze the temporal distribution and seasonality of cardiovascular disease(CD) mortality in elderly, fire outbreaks, temperature, humidity and fineparticulate matter in the city of Cuiabá in the period 2000-2011, with theexception of particulate matter whose series was available only for 2007-2011.Methods: An ecological study of annual series of mortality data from theMortality Information System for the public health system. The seasonality wasanalyzed by comparing the ratios of mortality in dry, intermediate and wet, ata significance level of 5 % periods. The percentage change in the trend of theperiod also is analyzed. Results: Mortality from cardiovascular diseases in theelderly in the city of Cuiabá shows an upward trend in the past 12 years with apositive percentage change of 58%. Mortality is about 70% higher in the dryseason compared to the wet and intermediate periods with statisticallysignificant differences. The point source of fires and fine particulate mattershowed a decreasing trend for the periods analyzed, with a negative percentagechange of -40% and -92%, respectively, however both variables have higherconcentrations in the dry period and only for point source of fire there is astatistically significant difference. The temperature and humidity are stablecharacteristic period of 12 years, with a variation of -3% and -13%,respectively. Conclusion: Although point source of fire and particulate matterpresent downward trend in the periods analyzed, it is observed to increase CDmortality in elderly over the study period as well as important seasonalvariation in prevalence of this event during the dry period. Funding: Thisstudy is a contribution from the Brazilian Research Network on Global ClimateChange , covenant FINEP / Rede CLIMA 01.08.0405.01 .

P1.34 - INFLUENCE OF GEOGRAPHICAL DISTRIBUTION OF VSL OCEANIC SOURCES AND THE STRENGTH OF CONVECTION ON THE TROPICAL BROMINE PARTITIONING

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Veryshort-lived (VSL) bromocarbons produced by ocean biology, together with their degradation inorganic products, affect the oxidation capacity of the global atmosphere. The partitioning between the source gas (SG) and product gas (PG) species within the tropical atmosphere affect the total bromine injection to the stratosphere,and depends on the interaction of several processes such as the geographical distribution of sources, the strength of convection and the photochemical lifetime of each species. We present a set of sensitivities studies performed with the CAM-Chem global chemistry-climate model aimed at understanding the contribution of different heterogeneous recycling reactions on the inorganic bromine burden of the marine boundary layer (MBL) and tropical tropopause layer (TTL). A state a state-of-the-art tropospheric and stratospheric halogen chemistry scheme considering physically-based heterogeneous processes over sea-salt aerosols and ice-particles, as well as an individual efficiency of washout/ ice-uptake removal for each bromine species, has been used. Our model results suggest that the sea-salt recycling contribution to the active bromine loading of the TTL is only important during periods of strong convection in local regions such as the Western Pacific warm pool, being negligible on a tropical annual average. Also, the occurrence of the ice-mediated recycling reactions strongly affects the total bromine loading of the TTL, affecting the strength of stratospheric injection. Globally, we modeled the tropical annual average stratospheric bromine injection due to VSL sources to be 5 pptv, with the inorganic contribution (PG ~3 pptv) surpassing the carbon-bonded portion (SG ~2 pptv). This implies that the larger portion of PGVSL injection is already in its active form in the lower stratosphere,where the ozone depleting potential of bromine is maximized.

P1.35 - AEROSOL MASS SPECTROMETRY OF NATURAL BIOGENIC AEROSOLS IN AMAZONIA

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The Amazon forest comprises a very largecontinental tropical forest area. Natural biogenic aerosols are producedsecondarily in the atmosphere (the SOA) from the oxidation of biogenicVOCs. Additionally, natural primarybiogenic aerosol particles (PBAP) add to the SOA in the organic aerosolcomponent. Therefore, the Amazon forest is an important laboratory for studyingbiosphere-atmosphere coupling and the links between the forest biology and theatmosphere arte very strong. Aerosols were collected in a pristine reserve 60km NNW of Manaus, in the so-called TT34 tower at the ZF2 ecological reservation. Most of the air masses travels for 2,000 Km from the tropical Atlantic to thesite, after being processed over pristine tropical rain forest. From July toDecember 2013, an Aerosol Chemical Speciation Monitor (ACSM – Aerodyne Inc.)was used to characterize non -refractory aerosol particles smaller than 1 μm atthe site. The period comprises the transition from wet to dry season, the wholedry season, and the beginning of the next wet

season. Other instrumentsanalyzed the aerosol size distribution (10-500 nm), aerosol light scatteringand absorption. Quartz filter analyses for Organic and elemental carbon using aSunset instrument were also performed. Theaverage total aerosol loading for the whole period was found to be 2.94 (±1.67)µg/m^3, of which 83.6% are of organic composition, 8.9% are NH4, 3.9%are SO4, 3.4% are NO3, 0.05% is Chloride. Largevariability on the aerosol composition is observed associated with meteorology,storms and other climatic conditions. The 30 minutes organic aerosolconcentrations will be associated with aerosol absorption and scattering, aswell as size distribution to calculate the effects of SOA and PBAP on aerosoloptical properties over Amazonia in pristine conditions.

P1.36 - PARTICLE FORMATION THROUGH PHOTOSENSITIZED REACTIONS AT THE AIR-SEA INTERFACE

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The sea surface microlayer (SML) represents more than 70% of the Earth'ssurface and constitutes the boundary layer interface between the ocean and theatmosphere. TheSML is characterized by an organic enriched microlayer originating from marine chemicaland biological activities. Exposed to solar radiation, the SML represents asource of volatile organic compounds (VOC) as well as of highly functionalizedVOCs.

Consequently, thequestion arises as to whether photo-induced chemical processes under relevant atmospheric conditions lead to secondary organic aerosol (SOA) loading in themarine boundary layer. Previous works have shown that photochemical processinglead to the formation of highly functionalized VOCs which may be potentialcandidates to the SOA loading. In order to bring further comprehension, amultiphase atmospheric simulation chamber has been used in order to study the chemical processes occurring at the air-sea interface. Experiments have been performed in a 2 m3 chamber made of FEP filmin which a glass container for liquids is inserted. Light processing wasinitiated using VUV lamps (centred at 365 nm) in order to irradiate the liquid mixture containing humic acid used as photosensitizer and nonanoic acid used asa surfactant. Particle formation was monitored using an ultrafine condensationparticle counter (d50 > 2.5 nm) and particle growth was followedby a SMPS. VOCs formed have been identified and analysed by Proton TransferReaction – Time of Flight Mass Spectrometer and GC/MS. The chamber is alsoequipped with trace gas analyzers continuously measuring NO-NOX and ozone.

The liquid mixturewas exposed to VUV irradiation for 14 hours at least. When the light was turnedoff, ozone was added in the gas phase. Light-induced processes showed a lowincrease of particle concentration while secondary reaction implying ozone showeda significant contribution in SOA formation. These observations indicate thepresence of SOA precursors among the VOCs formed during irradiation. Atmosphericimplication of photosensitized reactions as a source of SOA loading in themarine boundary layer will be discussed.

P1.37 - OBSERVATIONS OF CHLORINE SPECIES IN THE UK

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Chlorine atoms are highly reactive radical species which have significant impact on the lifetimes of methane and other hydrocarbons, thus affecting local and regional air quality and global climate. The main source of chlorine in the atmosphere is sea-salt, with some minor anthropogenic sources (industrial processes, water treatment plants, fossil fuel burning). The database of direct observations of inorganic chlorine species is limited, which makes it difficult to understand the role of chlorine in atmospheric chemical processes. We report observations of chlorine species (Cl2, ClNO2) made in the UK in 2014 using a Chemical Ionization Mass Spectrometer, together with supporting chemical and meteorological measurements. We have analyzed these observations to investigate the sources and geographical distribution of inorganic chlorine in the UK and to assess its impact on ozone formation, hydrocarbons oxidation and the nitrogen cycle.

P1.38 - MULTI-PHASE HALOGEN CHEMISTRY IN THE TROPICAL ATLANTIC OCEAN

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This poster reports the resultsof a model study of halogenated species (chlorine, bromine, iodine) in thetropical marine boundary layer (MBL). Measurements of inorganic halogens (Cl2, HOCl, BrO, I2,IO) have been made at the Atmospheric Observatory on Sao Vicente island (Cape Verde)in 2007 and 2009; these observations have shown that significant concentrationsof chlorine, bromine and iodine species are present in the tropical MBLthroughout the year.

We have used a one-dimensionalmodel (MISTRA) to simulate the observed concentrations of HOCl, Cl2,IO, I2 and BrO and study the chemical processes in which thesespecies are involved. The model includes a detailed description of themeteorology and the microphysics and an up-to-date gas and aqueous phasechemical mechanisms.

The model could reproduce themeasurements of chlorine species, especially under unpolluted conditions, butit overestimated seasalt chloride and bromine species. Agreement with themeasurements could be improved by taking into account the reactivity withaldehydes and the effects of DMS and Saharan dust on aerosol pH; a hypotheticalHOX --> X - aqueous-phase reaction could alsoimprove the agreement with measured Cl2and HOCl, particularly undersemi-polluted conditions. The results showed that halogen levels and speciationare very sensitive to cloud processing, although the model could not reproducethe observations under cloudy conditions. The model results were used to calculatethe impact of the observed levels of halogens: Cl accounted for 5.4-11.6% oftotal methane sinks and halogens (mostly bromine and iodine) accountedfor 35-40% of total ozone destruction.

P1.39 - MODEL EXAMINATION OF NEW ANTARCTIC SEA-ICE, DMS DERIVED, AEROSOL FORMATION MECHANISM FOR THE SOUTHERN OCEAN REGION

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Recent measurements in the sea-ice region ofEast Antarctica have led to the discovery of a large scale aerosol formationmechanism that could be a significant source of cloud condensation nuclei (CCN)to the Southern Ocean and Antarctic region. The chemical-transport mechanism isintimately linked to the Antarctic Polar Cell circulation. Detailed analysis ofthe circulation revealed a well-defined downward draft that bringsupper-tropospheric air to the sea ice surface that is almost circumpolar(except for the Amundsen Sea quadrant), yet doesn't seem to influence coastalstations. Aerosol formation occurs within this circulation, transportingprecursors emitted in the sea ice region to the upper troposphere where theyare oxidised, prompting nucleation and growth. Exhaustion of the precursorreservoir halts aerosol nucleation and growth, and the new aerosol populationsare transported in the circulation down to the sea ice surface. It is here thatthe air-mass is replenished with precursor species and a large fraction of theair mass rises above the boundary layer and travels north to the Southern Oceanand mid-latitudes, where, after growth via condensation of precursors andcoagulation, aerosols grow to climate-relevant sizes.

Here we quantify this process using astate-of-the-art Earth system model to examine the aerosol numberconcentrations in the sea ice region. The Earth system model utilised here,HadGEM3, includes the UKCA composition module, with the aerosol microphysicsmodel GLOMAP. Currently, UKCA's treatment of DMS in sea ice regions assumeszero flux from sea ice. We perturb the system by changing the flux of DMS from sea ice, based on valuesobtained from the literature. The effect of these DMS perturbations on aerosolnucleation and CCN in the Antarctic and Southern Ocean regions is thenassessed. This work could help to explain a missing component of the SouthernOcean CCN budget currently present in global models as well as lend support tothe model derived from experimental data.

P1.40 - IMPACTS OF LONG AND SHORT-TERM CLIMATE VARIABILITY ON TERRESTRIAL BIOGENIC EMISSIONS AND GLOBAL AND REGIONAL ATMOSPHERIC CHEMISTRY

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Terrestrialvegetation emits a wide range of biogenic volatile organic compounds (BVOC) intothe atmosphere (~1150 TgC/yr), which accounts for ~90% of total VOC surfaceemissions. Emissions of BVOC are largely dependent on environmental factorssuch as sunlight and temperature, which makes them sensitive to both long-termand short-term changes in the climate system. ENSO is well-known to have globalimpacts on temperature and precipitation, and therefore has the potential toimpact regional BVOC emissions on inter-annual time-scales. In addition tothis, increased global mean temperatures and atmospheric carbon dioxide (CO2)concentrations over the past few decades and changes in land use may also haveaffected BVOC emissions. Once in the atmosphere, these compounds have theability to influence global and regional atmospheric chemistry and climatethrough impacts on the hydroxyl radical, ozone and methane lifetime.

We usethe NCAR Community Land Model (CLM) coupled to the Model of Emissions of Gasesand Aerosols from Nature (MEGANv2) to investigate both long-term changes andinter-annual variability of BVOC emissions over a 50-year period at regionaland global spatial-scales. This is done by considering the impacts of increasingtemperatures and CO2 concentrations in contrast to the effects ofland-use change on long-term emissions of BVOC. In addition, the MultivariateENSO Index (MEI) is used to investigate the regional response in emissions due tonatural ENSO variability. From the CLM simulations four sets of emissions havebeen derived. These are global composites of ENSO-positive and ENSO-negativephase emissions and 1954-1963 and 1993-2004 decadal mean emissions. Thesedatasets are then used to drive global atmospheric chemistry simulations usingthe NCAR Community Earth System Model (CESM) to investigate the impact ofshort-term and long-term variability in BVOC emissions on atmospheric composition.Through comparisons with 6 years of measurements from the Cape Verdeobservatory in the tropical Atlantic Ocean, we explore the role of inter-annualvariability in terrestrial biogenic emissions in controlling the observed variabilityin methanol, acetone and acetaldehyde in the remote tropical atmosphere.

P1.41 - QUANTIFYING ISOPRENE AND MONOTERPENES IN THE REMOTE MARINE BOUNDARY LAYER

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Isoprene and monoterpenes, emitted by marine phytoplankton, are highly reactive volatile organic compounds (VOCs). They are a potential source of marine secondary organic aerosol, which affects the microphysical properties of shallow marine clouds and in turn may cause climate cooling. However, the importance of isoprene and monoterpenes in the remote marine boundary layer is highly uncertain due in part to a paucity of measurements in those regions, resulting in large uncertainties in model estimates of global oceanic emission fluxes and their seasonal and diurnal variability.

During recent sea-going fieldwork in the Atlantic (Atlantic Meridional Transect, 50°N to 50°S, Oct/Nov 2012 and 2013) and in the Arctic (ACCACIA, July/Aug 2013), trace isoprene, monoterpenes, including a-pinene, and other VOCs were measured in air by Thermal Desorption-Gas Chromatography-Mass Spectrometry (TD-GC-MS). Seawater samples were analysed concurrently for the same gases using a coupled automated Purge & Trap system, with water taken from the continuous ship underway supply (5 m depth) as well as from depth casts. The obtained results for terpene concentrations inthe lower atmosphere and surface ocean span a large latitudinal range with good resolution (typically at least 1 air/water sampling cycle per 1.5 h) and enable the calculation of an extensive dataset of sea-to-air fluxes for these compounds which may be used in modelling studies.

The cruises sampled regions of generally low marine productivity. Low levels of isoprene and monoterpenes were observed; isoprene atmospheric mixing ratios were predominantly <5 pptv and often below the detection limit of <0.6 pptv, and water concentrations were generally <50 pmol L-1 (detection limit ca. 3 pmol L-1) along the cruise tracks.

Suggested controls on production of marine isoprene include temperature, light and phytoplankton functional type and abundance. A first inspection of our data does imply a biological control, with lower concentrations in areas of low biological productivity such as the Atlantic gyres and the Arctic waters. This presentation will describe the likely controls of isoprene in ocean surface waters, exploring potential relationships with biological, chemical and physical parameters.

P1.42 - TWO-PARAMETER APPROACH FOR ESTIMATING BIOMASS BURNING EMISSIONS OF NOX FOR THE AFRICAN CONTINENT

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Biomass burning is a majorsource of atmospheric aerosols and trace gases, among them nitrogen oxides (NOx).Large amounts of NOx significantly impact on atmospheric chemistry,air pollution, and climate. Several studies investigated the quantities anddistributions of NOx emissions from fires, regionally and globally. However,there still exist large uncertainties in the approaches due to uncertainties inthe different parameters.

In this study, troposphericNO2 vertical columns (TVC NO2) from polar orbitingsatellite instruments and fire radiative power (FRP) from polar orbiting andgeostationary satellite instruments are used to estimate biomass burningemissions of NOx for the African continent.

The method is based on the empiricalrelationship between TVC NO2 and FRP, which forms the basis forestimating fire emission rates (FERs) of NOx for different landcover types. The diurnal cycles of FRP as obtained from the geostationarysatellite sensor have been derived for the major types of open biomass burning.This information is applied for the computation of temporally integrated FRP,here referred to as fire radiative energy (FRE). The product of these twoparameters (FERs of NOx and FRE) yields some interesting insightsinto total NOx emissions on different spatio-temporal scales.

Possible factors affecting the magnitude of calculated emissions of NOxare discussed.

P1.43 - ATMOSPHERIC CHEMICAL SPECIATION OF REACTIVE NITROGEN COMPOUNDS APPLIED TO BRAZILIAN TROPICAL FORESTS AND SUBSTITUTION PLANTATIONS

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Studies of chemical speciation of reactive nitrogen compounds (Nr) ingas phase and suspended particles have been undertaken in the air of differenttypes of tropical forests and substitution plantations in Brazil. The objectives were to determine the different compositions of reactive nitrogencompounds of some types of tropical forests and the corresponding changesresulting from substitution by plantations. Three types of forests have been studied: Amazonia humid forest andcleared area covered with cattle pasture; Cerrado, a semiarid shrub forest, andan area shifted to soybean plantation; and a coastal marine coconut plantedforest. Sampling design consisted of intensive five days sampling campaigns inparallel at the native forest and the substituted plantation, both in dry andwet season. Sampling speciation of volatile and semi-volatile reactive speciescontaining nitrates (NO3-) and ammonium ion (NH4+)were obtained by a combination of thermal diffusion and analyzed by ionchromatography. Ammonia was collected in diffusion tubes coated with anddetermined by molecular spectroscopy. NO2 was collected by passivediffusion tubes and determined by Griess - Saltzman method. From the threeforest region studied, the Amazonia, both in the deep natural forest and in thearea transformed into pasture, presented the highest amount of reactivenitrogen in the atmosphere, with a total Nr mean concentration ranging between70 and 423 nmol Nr.m-3 in the rainy and dry seasons, respectively. Levelsof mean Nr concentrations in the Cerrado forest were much lower than the ones of Amazonia, ranging from 32 and 146,82 nmol Nr. m-3, the largestdifference found between the native forests during the dry period. In both systems the wet season showed lower mean Nr levels than in the dry season. The replacement of the original forest by pasture and agriculture activities resulted in increased levels of these reactive nitrogen species in air,indicating losses of soil fertilization. Ammonia is the dominant Nr species inthe Amazonia forest, and levels increase as native forest is substituted bypasture favoring soil acidification.

P1.44 - CARBON FLUX ESTIMATION BY USING ACTM FOR THE PERIOD 1990-2011

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We have estimated carbon flux by using the CCSR/NIES/FRCGC AGCM-based Chemistry Transport Model (ACTM) in a Bayesian synthesis inversion framework. The quality of ACTM transport has been assessed for synoptic to inter-hemispheric time/space scales using simulations of SF6 and 222Radon concentrations in comparison with observations. Carbon fluxes were estimated for 84 regions (54 land+ 30 ocean) over the globe during the period of 1990-2011 from atmospheric CO2 concentrations at 74 sites from the GLOBALVIEW-CO2 (2013) data product. Seasonally varying a priori fluxes for (1) atmosphere-ocean exchange are taken from Takahashi et al. (2009), (2) interannually varying a priori fossil fuel fluxes (incl. cement production) are taken from CDIAC, and (3) 3-hourly terrestrial biosphere fluxes from the Carnegie Ames and Stanford Approach (CASA-TransCom) terrestrial biosphere model (annually balanced). As a result of time-dependent inversions, mean total flux (excluding fossil fuel) for the period 1990-2011 is estimated to be -2.94 GtC/yr, where land (incl. biomass burning and land use change) and ocean absorb CO2 at an average rate of -1.77 and -1.17 GtC/yr, respectively. The land uptake is mainly due to northern land (-1.37 GtC/yr), while the tropical and southern lands contribute -0.17 and -0.23 GtC/yr, respectively. It is also found that Boreal North America and Boreal Eurasia show negative trends in the estimated fluxes during the analysis period. The global ocean sink has no clear long-term trend in the period. The regional land fluxes are compared to CASA-GFED3 simulations from NASA/GSFC, which includes the interannual variations in FPAR, meteorology, and fires.

Acknowledgements. We thank the GLOBALVIEW-CO2 data providers for their continued support by sharing measured CO2 concentrations. Thanks are also due to Yosuke Niwa for sharing 3-hourly neutral CASA fluxes.

P1.45 - SECONDARY ORGANIC AEROSOL FORMATION FROM STRESS-INDUCED BIOGENIC EMISSIONS AND POSSIBLE CLIMATE FEEDBACKS

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Atmospheric secondary organic aerosol (SOA) is formed by oxidation of Biogenic Volatile Organic Compound (BVOC) emissions. Besides constitutive emissions like monoterpenes and isoprene, trees also emit sesquiterpenes (SQT), methyl salicylic acid (MeSA), green leaf volatiles (GLV) and others when they are exposed to e.g.biotic stressors. Climatic changes will modify the living conditions of vegetation and may trigger Stress Induced Emissions (SIE). Therefore, it is important to understand how SIE will affect SOA formation and consequently aerosol effects on climate.

Experiments were performed in the Jülich Plant Atmosphere Chamber using real plant species from Boreal and Mid-European forests. The plants suffered from typical diseases,such as insect attacks and showed SIE. Yields of SOA formation for SQT, MeSA, and a special class of C17-BVOC and emission ratios of SIE/MT were determined (Mentel et al., ACP, 2013).

SQT and MeSA have SOA yields of ~20%, a factor of 3-4 higher than yields for constitutive MT emissions in reference experiments with unstressed plants. For C17-BVOC,the yield was ~30%, i.e. 5-6 times higher than for MT. In contrast, GLV emissions suppress particle formation in a manner similar to isoprene(Kiendler-Scharr et al., Nature, 2009). Our results indicate that stress induced changes of BVOC emissions strongly impact biogenic SOA formation, leading to increased (SQT, MeSA, C17-BVOCs) or decreased (GLV) SOA formation.

To investigate the potential importance of SIE-SOA, we estimated fractions of stressed trees from forest reports and observations of bee keepers in Southwest Germany. Applying the experimental SOA yields and emission ratios, together with estimated fractions of stressed trees for Midlatitude and Boreal regions,in the EMEP model showed that SIE-SOA can be significant and may even dominate biogenic SOA (Bergström et al., submitted to ACP, 2014).

Biotic stress, such as aphid infestation supports negative climate feedback and this may be effective already today. Heat and drought can turn the negative feedback into a positive feedback e.g. in forests dominated by deciduous trees. Since it is likely that climate change will affect SIE from vegetation, SIE and their SOA formation potential should be considered in future climate scenarios.

P1.46 - MEASUREMENTS OF BIOGENIC VOLATILE ORGANIC COMPOUNDS IN AN OAK FOREST ECOSYSTEM IN SOUTHERN FRANCE IN SPRING 2014: OVERVIEW OF THE INTENSIVE CAMPAIGN

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As a follow-up of a campaign performed at the Oak Observatory at OHP (O3HP, southern France) in spring 2012 (Kalogridis et al. 2014), measurements of biogenic volatile organic compounds (BVOC) were performed at the same site in spring 2014 (CANOPEE/CHARMEX project). The main objective of this campaign was dedicated to the measurement of the OH reactivity as described in the companion poster by Zannoni et al. This presentation will give an overview of the measurement campaign and will present preliminary results of the BVOC measured on site.

The oak observatory (43.93°N, 5.71°E) is dominated by Quercus pubescens Willd., a high isoprene emitter. BVOC measurements were performed from May 28th to June 12th with a PTR-MS (mass scan mode from m/z 31 to m/z 137), a GC-FID (light hydrocarbons including isoprene) and a liquid fluorescence analyser (formaldehyde), as well as measurements of nitrogen oxides, ozone and black carbon. Measurements inside and above the canopy, at 2 m and 10 m aboveground respectively, were performed sequentially and were completed by a screening of the compounds emitted by the Downy Oak at the branch level (enclosure).

Atmospheric levels of isoprene went up to 20 ppb on days associated with temperature higher than 30°C (maximum of 23 ppb at 2 m and 19 ppb at 10 m). Corresponding levels of other compounds were (for 2 m and 10 m respectively): formaldehyde (3,3-3,0 ppb), acetaldehyde (1,6-1,1 ppb), acetone (3,4-2,3 ppb), methanol (9,6-8,4 ppb), sum of methyl vinyl ketone and methacrolein (1,1-1,1 ppb) and monoterpenes (0,7-0,5 ppb). Monoterpenes' daily maximum was most of the time below 0.4 ppb, except on the warmest days ($T>30°C$) when values up to 1 ppb were observed.

These measurements are used to estimate the "calculated" OH reactivity (based on the individual compounds concentration weighted by their reaction rate coefficient with OH) which will be then compared to the measured OH reactivity (see poster from Zannoni et al. in the same session).

P1.47 - THE WIND MEANDERING DURING DAILY CONDITIONS IN THE AMAZON REGION OF BRAZIL

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The aim of this work is to analyze the existence of the wind meandering phenomenon through the autocorrelation functions to daily conditions using data from the Amazon region of Brazil in January 2001. The data were measured on a micrometeorological tower at 10 Hz (10 measurements of a given variable every second). The u, v and w wind components and air temperature were used in this work. The autocorrelation function measures the correlation of a variable at agiven moment for herself in an instant of time later and is calculated for periods of one hour. Besides the autocorrelation function, calculated on the basis of experimental data, were made fits of this function on the methodology proposed by Frenkiel and Degrazia. The fits used are based on the Gauss-Newton algorithm, which is to adjust a non-linear model and solve a linear least squares problem. Was also evaluated the friction velocity, Monin-Obukhov length and sensible heat flux. The wind meandering is characterized by very large negative lobes observed in the autocorrelation functions. The calculations show that the existence of the wind meandering during daily conditions and low wind speed is associated with negative values ??of the Monin-Obukhov length, indicating convective conditions. In these conditions, the friction velocity is low and the sensible heat flux is close to zero and positive. Thus, the wind meandering can be modeled for convective and low wind speed conditions, including a new line of research to researchers in atmospheric dispersion and air pollution.

P1.48 - EVIDENCE FOR OCEANIC EMISSIONS OF VOLATILE ORGANICS AND METHANESULFONIC ACID (MSA) OVER THE TROPICAL PACIFIC OCEAN

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Observations obtained during the Pacific Atmospheric Sulfur Experiment (PASE) over the equatorial Pacific are analyzed using a 1-D chemical transport model. In general, observed OH and HO2 vertical profiles are well simulated. However, in two of fourteen research flights that are affected by convection, we found significantly higher HO2/OH ratios in the buffer layer than the other flights. Model simulations indicatethat fast-reacting oxygenated volatile organic compounds, which can react rapidly with OH and provide additional primary radical sources through photolysis, are necessary to explain the observations. Ocean upwelling during convection may expedite the release of ocean organics. In addition to changing HOx, the release of organics from the ocean can help explain the underestimation of marine organic aerosols in previous model studies. We also analyzed the observed MSA profiles, which decreases sharply from the surface to 600 m, implying a surface MSA source of 4.0×107 molecules/cm2/s.We find that the observed large increase of MSA from the boundary layer into the lower free troposphere (1000-2000m) results mainly from the degassing of MSA from dehydrated aerosols. We estimate a source of 1.2×107 molecules/cm2/s of MSA to the free troposphere through this pathway.This source of soluble MSA could potentially provide an important precursor for new particle formation in the free troposphere.

P1.49 - H2O AND CO2 FLOWS AND RELATIONS WITH CLIMATE VARIABLES IN THE AMAZON

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The interannual energy fluxpatterns and seasonal patterns of CO2 and H2O areevaluated through field measurements in an experimental site in the Amazon. Theresults suggest that the patterns of H2O are influenced by the windin the region, with higher concentrations when the wind comes from thedirection of the Tapajos river, and it is usually dry when the wind comes fromregions near the pasture. The CO2 cycle also shows seasonality defined, and probablyhave control by offering radiative, which means that there are lower emissionsduring the hottest parts of the region, because the stomatal vegetation control.

P1.50 - THE ANALYSIS OF DRY DEPOSITION OF ACIDIFYING SUBSTANCES IN MALAYSIA"S GAW STATIONS

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Malaysia through the Malaysian Meteorological Department (MetMalaysia) is operating three GAW monitoring stations, namely GAW Global (baseline) station in Danum Valley (DV) and two GAW Regional stations which are located in Cameron Highlands (CH) and Petaling Jaya (PJ). Filter packs were used at the GAW stations in Malaysia to measure concentration of reactive gases NH3,HNO3, HCl and SO2 and particulate component consists ofSO42-, NO3-, Cl-, Na+,K+, Ca2+, Mg2+ and NH4+. The composition of dry deposition of acidifying substances is compared between the GAW stations in Malaysia. The analysis shows that NH3 is the most abundant gas at all sites.

P1.51 - ASSESSMENT OF ATMOSPHERIC WET DEPOSITION AT CAPE POINT, SOUTH AFRICA

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The study of precipitation chemistry is of vital importance for understanding the chemical systems and cycles in the atmosphere of the earth. Studying long-term trends for rain water chemistry and acidity is essential in understanding changes in the composition of the atmosphere. The IDAF (IGAC/DEBITS/Africa) project forms part of the global Deposition of Bio-geochemically Important Trace Species (DEBITS) project that is driven by the International Geosphere Biosphere Program (IGBP) and the International Global Atmospheric Chemistry (IGAC) programs. The objectives of IDAF are to determine the chemical composition of the atmosphere in the tropical belt of Africa and to measure the atmospheric wet and dry deposition of chemical species in the atmosphere. The Cape Point Global Atmosphere Watch (CPT GAW) station is considered to be an important site for southern hemisphere oceanic background measurements and it is also the only marine background site within the IDAF network in southern Africa. WMO quality control and quality assurance protocols were followed in the collection and analysis of the rain samples. Rain samples were obtained with an automatic wet-only sampler. Conductivity, pH and suppressed ion chromatography measurements were performed on these samples in order to establish the acidity and chemical composition of precipitation events from 2004 to 2013. The average pH was found to be 5.48 and ranged from very low (3.4) to relatively high (6.8) values. A relatively clean southern hemisphere marine signal is observed in the majority of events characterized by a strong correlation between Na+ and Cl-, as would be expected for rain samples originating from marine sources. Low SO42-levels indicate a relatively small anthropogenic influence on the rain composition at this site. The chemical composition of rain events can be explained relatively well by back-trajectory analysis due to the absence of a large number of contributing sources. This is the first report on precipitation chemistry at the CPTGAW atmospheric monitoring station.

P1.52 - OBSERVATIONS OF ESSENTIAL CLIMATE VARIABLES AT THE GAW ATMOSPHERIC RESEARCH STATION AT MACE HEAD

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Observations of Essential Climate Variables at the GAW AtmosphericResearch Station at Mace Head

The MaceHead Atmospheric Research Station located on the west coast ofIreland is a Global Atmosphere Watch (GAW) Research Station and isone of the most advanced supersites in Europe, and measures virtuallyall of the Essential Climate Variables in the atmospheric domain,covering composition, surface and upper-air.

Observations at Mace Headinclude:

A wide range of aerosolparameters

The major greenhouse gasesand halocarbons

Operational ground-basedremote sensing and profiling including aerosol optical depth, cloudproperties using a cloud radar, and a microwave profiler whichprovides humidity & water vapour profiles

Meteorologicaldata from Met Éireann's synoptic Tucson weather station

Theseobservations permit studies of trends, long range transport to MaceHead and source apportionment studies.

Allmeasurement systems are networked locally and data are webcast every5 minutes (http://www.macehead.org)and transmitted in near real time to NUI Galway's datainfrastructure and thereafter to national and internationaldatabases.

MaceHeadhas been a site for aerosol measurements since 1958 when aerosolcondensation nuclei were measured at a small coastal lookout postadjacent to the present Mace Head station. UniversityCollege Galway (UCG) purchased in 1973 a derelict cottage close tothe lookout post.In the mid 1980’s the cottage was refurbished by UCG andin 1987the “Cottage” Laboratory became one of 5 global sites forthe Global Atmospheric Gases Experiment (GAGE) programme. By 1990, 2Shore Laboratories were constructed along with a 23m tower.

Mace Head has become a part ofmany global and regional observing networks and projects and isrecognized worldwide as a key location in the study of air qualityand climate change. In 1988, it became an EMEP station, and is adesignated EMEP level-3 ‘supersite’. It was designated by theWorld Meteorological Organisation as a Global Atmosphere Watch (GAW)primary baseline station in 1994. Met Éireann installed an automaticsynoptic weather station on the site in 2002. From 1993 onwards, MaceHead became involved in many large-scale EU Projects. Trans-Nationalaccess to Mace Head is available through the FP7 IntegratingInfrastructure Initiative ACTRiS.Mace Headhad its 50th anniversary in 2008. Further details on Mace Head can beviewed at: www.macehead.org.

P1.53 - AIRBORNE MEASUREMENTS OF HCOOH IN THE EUROPEAN ARCTIC: A WINTER-SUMMER COMPARISON

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HCOOH is ubiquitous in the tropospehereand frequently observed in precipitation, gas and aerosol (Keene et al.,1995). HCOOH contributes to reducing the oxidative capacity of theatmosphere by the removal of OH radicals and dominates the free acidity ofprecipitation, influencing pH-dependent chemical reactions (Jacob, 1986).

Currently, there are very few in-situ measurements ofHCOOH collected within the Arctic Circle. Recent IASI satellite measurements reportedHCOOH concentrations up to five times greater than modelled outputs in the highlatitudes (Stavarkou et al., 2011),which has led to the suggestion of missing sources in the Arctic. This studyrepresents the first airborne measurements of HCOOH in the European Arctic andprobes unconfirmed sources of HCOOH using a chemical ionisation massspectrometer across two campaigns from winter to summer. A maximum concentration(<1.5km altitude) of 468 pptv was observed over the ocean during the summercampaign, over three times greater than the reported maximum land concentration.This data would suggest marine HCOOH sources dominate over proposed landsources in the European Arctic. The limitations of satellites to measure accuratelyover marine environments, highlights the need for in-situ measurements overmarine environments. One hypothesis has been the contribution of oceanicrelease of CH2I2. CH2I2 photolysis canlead to a source of the Criegee intermediate (CH2OO), this speciescan react with water vapour to yield HC(O)OH (Welz et al., 2012). Hopkins et al.,(2012) reported a summer average of 4.4 pptv with a maximum of 55.3 pptv for CH2I2emission in the European Arctic. Using modelled CH2I2 photolysisrates (July 2012, 70°N latitude), a steady state approximation was used toderive concentrations of CH2OO and subsequently HCOOH concentrationsfor a range of CH2I2 emissions. These calculationsreported HCOOH concentrations of up to 359 pptv (for the reported maximum

CH2I2emission), representing a potentially significant pathway for HCOOH production. The role of marine CH2I2 emission in the European Arctic HCOOHbudget remains uncertain however estimates presented in this study wouldsuggest CH2I2 emission may represent an significant marinesource of HC(O)OH potentially dominating the Arctic HCOOH budget.

P1.54 - CHLOROPHYLL-A AND OTHER OCEAN COLOR PRODUCTS AS PREDICTIVE TOOLS OF THE ORGANIC MASS FRACTION IN SUBMICRON SEA SPRAY

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Initial efforts to develop acombined organic-inorganic sea spray source function parameterization forlarge-scale models made use of chlorophyll-a (Chl-a) as input parameter tocombine oceanic biology and sea spray production dynamics. These studiesreported a modest correlation coefficient (0.55) between chlorophyll-a andorganic matter (OM) enrichment in sea spray, suggesting that chlorophyll-a isonly partially suitable for the task. In order to check if better biologicalactivity surrogates are available from satellite measurements, the followingresearch activity has been carried on, using aerosol data collected at MaceHead research station (Ireland) and satellite ocean color products from the ESAproject GlobCOLOUR. A reconstructed chlorophyll-a field of the North AtlanticOcean, based on daily data, reveals an improved correlation coefficient of 0.72between the fractional mass contribution of organics in sea spray and seasurface chlorophyll-a concentration. The same analysis, performed using twodifferent ocean color products, namely "colored dissolved and detrital organicmaterial absorption" (CDM) and "particulate organic carbon concentration" (POC),revealed slightly lower correlation coefficients (0.65 and 0.68). According tothese results, to date, chlorophyll-a must be considered the best biologicalactivity tracer from satellite measurements for predicting sea spray organicenrichment. In fact, considering the minimal difference between the correlationcoefficients obtained with the three ocean color products, there is no reasonto substitute chlorophyll-a, which is the most accurate parameter obtained fromocean color data, with other proxies of the oceanic biological activity, beinggenerally affected by larger and less characterized errors. The observed timelag between chlorophyll-a concentration and organic matter enrichment in submicronaerosol suggests that biological processes in oceanic surface waters and theirtimescales should be considered when modeling the production of primary marineorganic aerosol. A novel relationship describing the enrichment of organic matterin submicron sea spray aerosol, as a function of both sea surface chlorophyll-aconcentration and wind speed, to be implemented in large scale models, isproposed as a conclusion of this study.

P1.55 - PHOSPHORUS SPECIATION IN ATMOSPHERIC DEPOSITION SAMPLES IN THE EASTERN MEDITERRANEAN: FLUXES, ORIGIN AND BIOGEOCHEMICAL IMPLICATIONS

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The Mediterranean Sea has one of the most oligotrophic surface waters in the worldwith Low Nutrient and Low Chlorophyll. The deep water of the East MediterraneanSea has a uniquely high DIN/DIP ratio raging from 25 to 28, compared to the Western Mediterranean (22) and the "normal" oceanic Redfield ratio of 16 (Krom et al., 1991). The primary productivityin the Eastern basin is phosphorus limited and new knowledge could be arisen by defining the role of organic and inorganic forms of atmospheric deposited P.

The speciation of P in depositionsamples (rain & dry) was determined according to the analytical protocolreferred in Standard Methods for the Examination of Water and Wastewater (20thEdition). Total Phosphorus (TP) in both soluble and insoluble matter wasmeasured after acid digestion of samples according to Persulfate DigestionMethod; TP was measured colorimetrically as PO43- at690nm using the stannus chloride method. TP recoveries obtained with the use ofcertified reference materials (MESS-3) were found to be to 98±12%. DissolvedPhosphate (DIP) was determined as HPO42- by AnionChromatography (IC), while Total acid hydrolized Inorganic Phosphorous (TIP)was determined after mild oxidation of sample (pH=1.6) with sulfuric acid(0.02M), separately in filtrate and filterable sample. Organically boundphosphates were determined in both soluble (DOP) and insoluble matter (POP) bysubtracting TIP from TP, while the condensed phosphates (pyro-, meta-, andother polyphosphates), called CP, were determined only in the soluble fractionby subtracting HPO42- from soluble TIP. In selected samples P speciation was alsoconducted using novel synchrotron-based techniques (P-NEXFS) providing valuable insights into thecomposition and therefore the factors influencing the solubility andbioavailability of phosphorus in deposition samples.

A total of 43 rain events were collected overtwo years period (2012-2013) at Finokalia (Crete). Significant was found thecontribution of organic P species both in soluble and insoluble fraction of wetdeposition with percentage contribution of 86% and 62%, respectively. Significant wasthe phosphorus in dry deposition since the average percentage contribution of dry deposited TP during both years (n=73) was estimated 57% of total deposition.

P1.56 - ARCTIC SURFACE OZONE DEPLETIONS FROM OZONE SOUNDINGS

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Episodes of ozone depletion in the lowermost Arctic atmosphere (0-2 km) in the polar spring are understood to result from catalytic reactions involving bromine derived from sea salt. Arctic sites consistently show ozone depletion in the surface boundary layer throughout the spring months, sufficient at some sites to markedly affect the annual cycle, and produce an ozone minimum in spring. Although this is a natural phenomenon -- the long ozonesonde record at Resolute shows depletions since the beginning of the record in 1966 – it appears to be changing: the recently re-evaluated Resolute record also shows an increase in their frequency over the period 1966-2013 of 6.8 ± 3.7% per decade (95% confidence limits). In addition, surface sites show a shift toward increasing frequency earlier in the year. These changes are examined in the context of other changes in the Arctic boundary layer.

P1.57 - CLOUDLESS AND ALL-SKY DOWNWELLING BROADBAN AND SPECTRAL SOLAR IRRADIANCES PARTITION INTO DIRECT AND DIFFUSE OVER THE AMAZON FOREST: DIURNAL AND SEAONAL VARIABILITY

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Biophysical andchemistry modules in current climate models require, as input, detailed prognosticof downwelling solar irradiance at the surface, nominally spectral distributionand partition into diffuse and direct components. However, Radiative Transfer Models(RTMs) existing in most climate models struggle to predict accurately solar diffuseand spectral irradiance, in particular under polluted and cloudy conditions. So,in this regard, there is a need to improve current knowledge on the shortcomingsof these RTMs. Closure experiments comparing RTM simulations with measurements iscertainly a valuable method to do so. The present study uses measurementsperformed by a MultiFilter Rotating Shadowband Radiometer (MFRSR) operating 50km upwind from Manaus in the context of ACONVEX (Atmospheric CONVectionEXperiment) to characterize diurnal and seasonal variability of the cloudlessand allsky broadband and spectral surface irradiances, as well as thepartition into direct and diffuse over the Central Amazonia. Results forcloudless conditions are applied in a preliminary closure experiment aiming toevaluate a RTM, i.e. the Santa Barbara DISORT Atmospheric Radiative Transfer(Ricchazzi et al., 1998). For broadband irradiance, observed minimum DiffuseGlobal Ratio (DGR) varied from ~10% (at SZA=20°) to ~20 % (at SZA= 75°) while modeled DGR variedfrom ~10% to ~25%, for the same SZA range. For the spectral channel 414 nm, under identical Sun geometry, minimum DGR varied from ~20% to ~70%, for bothobservations and RTM predictions. These results suggest that under molecular scatteringregime (cloudless and unpolluted conditions), when GDR is expected to be low,model performance is consistent with measurements. On the other hand, for higherGDR conditions, in spite of being driven by observed optical properties, modelis unable to reproduce GDR observed variability, in particular for SZA lowerthan 60° and for broadband irradiance.

SESSION 2: ATMOSPHERIC CHEMISTRY AND THE COUPLING BETWEEN BIOGENIC AND ANTHROPOGENIC EMISSIONS

P2.1 - FUNGAL ORIGIN BIOAEROSOLS IDENTIFICATION IN THE CITY OF SÃO PAULO, BRAZIL

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The atmospheric aerosol is composed of many different compounds including that related to bio-aerosols, with very few studies, especially to the South Hemisphere. This work is part of a thematic Project “Narrowing the uncertainties on aerosol and climate changes in São Paulo State – NUANCE”, and aims to analyze the correlation between the number of bioaerosols and the mass and composition of the particulate matter(PM) in its fine and inhalable fractions, for different weather conditions. The bioaerosols are important in the epidemiological context and also by their influence on climate processes. To collect the material, the equipment "Recording Burkard" (Burkard Manufacturing Co., Ltd., Rickmansworth, United Kingdom) was used, operating at 10L/min. Samples were collected for periods of 24 hours daily. This methodology allows the identification of species that were not possible with the culturable method. The specimens found were classified into: Alternaria, Arthrinium, Botrytis, Cercospora, Cladosporium, Curvularia, Drechslera-like, Epicoccum nigrum, Oidium, Penicillium/Aspergilus-like, Periconia, Pithomyces chartarum, Spegazzinia, Stemphylium, Tetraploa, Torula, Mitosporic fungi - others, Diatrypaceae, Leptosphaeria-like, Paraphaeosphaeria michotii, Pleospora-like, Sporormiella, Venturia, Xylariaceae, Ascospores with 2 cells colored , Ascospores with 2 cells colorless, Ascospores with 4 cells colored, Ascospores with 4 cells colorless, Ascospores - others, Agaricaceae, Agrocybe-like, Conocybe-like, Coprinus-like, Panaeolus/ Psathyrella, Laccaria, Ganoderma, Hyaline basidiospore, colored basidiospore, Gliomastix, Teliospores – Smuts, Rust, Myxomycetes, unknown, Delitschia, Melanospora, Peronosporo, Sciérophella, Sordaria, Stropraria, Farlowiella, Asperisporium. The main groups was classified as following: Hyaline basidiospore (1,4 x 104 spore/m^3; 57,34%),Cladosporium (2,7 x 10^3 spore/m^3; 10,39%), Unknown (1,8 x 10^3 spore/m^3; 7,14%), Coprinus-like (1,5 x 10^3 spore/m^3; 5,95%), others Ascospores (1,0 x 10^3 spore/m^3; 4,16%), others Mitosporic fungi (0,5 x 10^3 spore/m^3; 2,03%). Concentration and percentage are equivalent with others studies. The correlation between the meteorological parameters and spore was not significant mainly due to the little amount of data until now. The correlation between the spore number and the PM2.5 concentration had a R^2=0,062, what can indicate that the process involving the formation and deposition of spores are not related with that for PM. However more studies are under development with the collection of more data for other periods of the year.

P2.2 - GASEOUS ELEMENTAL MERCURY (GEM) MEASURED AT CAPE POINT FROM 2007 – 2011

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In addition to acomprehensive list of long-term gaseous and aerosol observations, continuousmeasurements of gaseous elemental mercury (GEM) have been conducted at CapePoint (34.21ºS, 18.29º E, South Africa) since March 2007. The Cape Point station is part of the GlobalAtmospheric Watch (GAW) network initiated by the World MeteorologicalOrganization (WMO). Atmospheric mercury(Hg) is of global importance since it ischaracterised by long-range transport and partial transformation to highlyneurotoxic methylated mercury. Long-term monitoring is important, which canprovide valuable information on the oxidation mechanisms of atmospheric Hg. In this study five years of continuous GEM data, together with ancillarydata and calculated air mass trajectories, were investigated by means ofseveral statistical methods, which included multi-linear regression (MLR) andcluster analysis. These statistical analyses give further insight into thefundamental understanding of the temporal and spatial origin of GEM patternsobserved at Cape Point, for both continental southern Africa, as well as forthe southern hemispheric oceanic background. MLR was applied to determine an equation, with ancillarydata parameters as independent variables, which could be used to simulate themeasured GEM concentrations relatively well. Cluster analysis was used to dividethe GEM measurements into different GEM concentration groups, for which theorigins were studiedwith back trajectory analyses. Back trajectory analyses were further used todetermine the influence of the period of time that an air parcel spent over aspecific source region on GEM concentrations measured at Cape Point.Keywords: gaseous elemental mercury, statistical analysis,multi-linear regression, cluster analysis, back-trajectory analysis

P2.3 - MEASUREMENTS OF IN-SITU SOA FORMATION AND CHEMISTRY USING AN OXIDATION FLOW REACTOR

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During several recent field campaigns including GoAmazon2014, ambient gases and particles were exposed to controlled concentrations of OH, O3 or NO3 in-situ using a Potential Aerosol Mass oxidation flow reactor. Oxidant exposures in the reactor ranged from an hour to several weeks of equivalent atmospheric residence time, allowing the study of SOA formation and chemistry over this time scale. Oxidized air from the reactor was sampled directly (e.g.,HR-AMS, ACSM, PTR-TOFMS, CCN), and these results were correlated with collocated biogenic and anthropogenic tracers (e.g., SV-TAG sesquiterpenes and PTR-TOFMS aromatics). In general, OH oxidation of ambient air in the reactor led to significant SOA mass production (often several μg/m3 of SOA) during times of high precursor gas concentrations (e.g., mono- and sesquiterpenes). While SOA production correlated with measured gas-phase precursors, the total mass formed in the reactor was generally several times larger than could be explained with the aerosol yields of measured VOC's,including yields measured directly in this reactor in the laboratory. This suggests that a majority of gases that formed SOA in the reactor were not traditional SOA precursors. Additionally, most of the SOA mass increase occurred in the first 12 hours of equivalent atmospheric aging, suggesting that ambient SOA is predominantly formed close to emission sources from precursors with gas-phase reaction lifetimes of <1 day. At a remote pine forest site, the mainly biogenic aerosol added from <12 hours of oxidation had an atomic O:C of 0.54, only slightly less oxidized than the existing ambient aerosol O:C of 0.61. As OH exposures increased (up to 10-20 equivalent days), the OA gradually became highly oxidized (O:C>1) and partially revolatilized, demonstrating the competing effects of functionalization/condensation at low exposures vs. fragmentation/evaporation reactions for high exposures. SOA formation from O3 and NO3 oxidation correlated with biogenic gas-phase precursors, but led to smaller (<0.5μg/m3) SOA production, consistent with the ability for OH to achieve more generations of oxidation than O3 or NO3. Measurements taken in a variety of biogenic ecosystems with a wide range of anthropogenic influence were compared, allowing investigation of the effects of anthropogenic pollution on biogenic SOA formation.

P2.4 - ANNUAL VARIABILITY OF THE CHEMICAL COMPOSITION OF AEROSOL IN A HIGH-ALTITUDE SITE IN THE SOUTH-AMERICAN TROPICS (CHACALTAYA, 5380 M.A.S.L.)

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We present the chemical composition (major ions, sugars and their derivates, organic and elemental carbon) of PM10 samples collected twice a week at the northwestern ridge of the Mount Chacaltaya (16º21'S, 68º08'W, 5380 masl) between December 2011 and November 2012. Differences observed between diurnal and nocturnal composition suggest that at day-time the site is influenced by the planetary boundary layer (PBL), whereas at night-time it lies in the low free troposphere (LFT). In average, air masses transported to the site during the rainy season (mid-October to mid-April) show lower aerosol loading than during the rest of the year given the intense scavenging produced by convective cloud processes over the Amazon basin and uphill the Andes. Only biogenic markers (e.g. mannitol) show a significant increase, reflecting phenological activity of both Amazonia and Altiplano. During the transition period (mid-April to mid-June), the contributions of erodible soils (Li+, Ca2+) and likely urban OC emissions are observed. The influence of the biomass burning season (mid-June to mid-October) is conspicuous and identifiable given the increase of biomass burning markers (e.g. EC, anhydrosugars, K+, Cl-) and dust tracers, the latter most probably lifted in the air by pyroconvection. Mostly at daytime, an Altiplano biomass burning imprint can be identified on the filters. Nevertheless, at the core of the biomass burning season, most of the tracers are comparable to secondary aerosol present in aged plumes identified in previous works. This fact strongly suggests that the sampling site has a good regional representativeness.

P2.5 - DAY/NIGHT ACID RAIN PROFILES IN A MID-SIZED ANDEAN CITY. ANALYSIS OF VOLCANIC AND ANTROPOGENIC PRECURSORS

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Acidity and sulfate concentration in rain during day and night periods were analyzed in the densely populated Andean city of Manizales, Colombia, in order to understand possible contribution of anthropogenic and volcanic SO2 emissions in the formation of acid rain and its role in atmospheric chemistry dynamics over the city. Aerosol particles and SO2 derived from anthropogenic and natural sources are principal pollutants affecting air quality of Manizales – a city located on the western slopes of the central range of the Andes (urban population 367000; 2150 m.a.s.l). Besides, suspended particles have been found to be associated with increased sulfate concentrations in rain through scavenging processes in Manizales. Local climate in the zone is characterized by low wind speed. Prevailing winds follow diurnal air flow regimes –upslope during the day, downslope during the night. The nocturnal pattern of air movement is important for possible

transport of sulfur gas emissions from Nevado del Ruiz volcano, a natural source of sulfur species located 28 km away from urban zone. Previous studies suggested volcanic SO2 as a significant source of acid rain formation in Manizales (mean VWM-pH levels around 4.9 units). However,the lack of information regarding dynamics of anthropogenic and volcanic emissions (fluxes and dispersion patterns), makes difficult the comprehension and characterization of acid rain phenomenon around the city. In order to understand sources and dynamics of acid rain formation, rain samples were taken during two months for different diurnal (day/night) periods. Acidity and sulfate concentration profiles were analyzed with respect to meteorological information-distinct diurnal air flow regimes and precipitation levels. As well as, Hysplit modeling was implemented for analysis and comprehension of possible contribution regarding SO2 volcanic degassing from Nevado del Ruiz volcano. Results obtained revealed two different patterns of acidity, associated with distinct air flow regimes and diverse sources of pollutants. These preliminary results suggested factors important to quantify and modeling both anthropogenic and natural emissions in the mid-sized Andean city of Manizales, as a tool to understand atmospheric chemistry dynamics associated with sulfur compounds.

P2.6 - SEASONAL VARIATIONS OF BIOGENIC SECONDARY ORGANIC AEROSOL TRACERS FROM ISOPRENE AND MONOTERPENES IN CAPE HEDO, OKINAWA

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Secondary organic aerosol (SOA) contributes substantially to particulate organic matters that affect both regional air quality and the climate. Isoprene and monoterpenes are the main biogenic volatile organic compounds (BVOCs) acting as SOA precursors. However the understandings on their ambient abundances and controlling factors, and contributions to SOA or SOC (secondary organic carbon) mass are still ambiguous. In this study, aerosol samples (total suspended particles) were collected on a weekly basis at Cape Hedo, Okinawa, Japan in October 2009 to February 2012 using a high volume air sampler and pre-combusted quartz filter. Filter samples were analyzed for 6 isoprene- and 4 monoterpene-SOA tracer compounds using solvent-extraction/TMS derivatization followed by GC/MS determination. Their abundances, seasonal variations and contributions to SOA/SOC are examined.

We found that total monoterpene tracers (0.04–10.8 ng m-3, mean 2.0 ngm-3) are more abundant than total isoprene tracers (0.05–7.2 ng m-3,mean 1.6 ng m-3). 3-Methyl-1,2,-3-butanetricarboxylic acid (0.01–9.1 ngm-3, mean 0.8 ng m-3) was the most abundant compound among the monoterpene tracers, followed by pinic acid and 3-hydroxyglutaric acid. 2-Methylerythritol(0.01–3.4 ng m-3, mean 0.7 ng m-3) was the most abundant isoprene-SOA tracer, followed by 2-methylglyceric acid and 2-methylthreitol. Seasonally, monoterpene-SOA tracers peaked in spring, followed by autumn and winter. On the other hand, highest concentration of isoprene-SOA tracers appeared in summer, followed by autumn and spring. Using a tracer-based method, we estimated that the SOC masses contributed by monoterpenes and isoprene are 10.2 ng m-3 and 8.8 ng m-3, respectively. These results provide information to better understand atmospheric particulate organic matters in association with primary emission and secondary photochemical reaction during a long-range atmospheric transport.

P2.7 - CHARACTERIZATION OF PARTICULATE MATTER AND GASEOUS POLLUTANTS AT MANAUS AND AMAZONIAN TALL TOWER OBSERVATORY (ATTO)

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As widely known, Amazon Region plays a major role concerning significant ecosystems. When potential impacts on the human population and vegetation are considered, investigation regarding the interface forest-city is imperative. Therefore, two sampling sites were selected: Manaus city and ATTO (Amazonian Tall Tower Observatory), both enclosed in Amazon Rainforest. In both sites, the chemical compositions of individual particles were quantitatively elucidated using automated electron probe microanalysis low Z EPMA. PM2.5 were sampled and analyzed through Gravimetry, X-ray Fluorescence, Black Carbon and Ion Chromatography.

The SPA indicate the presence of biogenic particles and mineral dust are the majority in both places. Biogenic particles, in association with S or Cl, are an important component of ATTO site. As expected, soot particles were found just in the Manaus city, as there were no fires detected in the sampling period.

The PM2.5 results shows mass concentration about 8 μg.m-3 for wet season and 11 μg.m-3 for dry season with an exceptional peak above 50 μg.m-3, which would represent a decrease of 28% in life expectancy for local population. At ATTO site, sampling was performed during wet season in 2012 and dry season in 2013. Samples present a mass concentration about 2 μg.m-3 for each period, with traces of soluble iron, cooper, zinc and nickel.

Considering the harmful effects of gaseous pollutants, weekly passive sampling of BTEX, NO2, SO2, O3 and Acetic and Formic acids were carried out in both sites, during wet and dry seasons between February 2012 and June 2013. SO2 and NO2 concentration were low at ATTO (below 2 μg.m-3 for both pollutants), but considerably higher at Manaus (maximums above 15 μg.m-3). The opposite was noticed regarding O3. Acetic and Formic acid levels were elevated (maximums above 25 μg.m-3) at Manaus. The highest Acetic acid concentration was found at ATTO (above 30 μg.m-3). For all those pollutants, results were generally higher in dry season. VOCs results are still being treated.

When considering exclusively the dry season, some pollutants present concentration peaks comparable to large Brazilian capitals, which may present harmful effects to population's health such as decrease of life expectancy.

P2.8 - CLOUD DROPLET ACTIVATION AND HYGROSCOPICITY OF BIOGENIC AND ANTHROPOGENIC SECONDARY ORGANIC AEROSOL

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Secondary organic aerosol (SOA)has important impacts on air pollution, climate change and human health. Inspite of intensive studies, its formation, physicochemical properties andimpact still have large uncertainties. Recent field data and model analysis have shown that SOA isenhanced under anthropogenic influences. The interaction ofanthropogenic emissions such as anthropogenic VOC (AVOC) with biogenic VOC(BVOC) could change the particle formation and aerosol properties. Severalstudies have shown that the interaction of BVOC and AVOC can significantlyaffect the properties of SOA. However, the effect of interaction of BVOC withAVOC on cloud condensation nuclei (CCN) activity and hygroscopicity is unknown.Moreover, understanding the influence of AVOC on biogenic SOA (BSOA)properties is necessary to assess the radiative forcing of aerosol due to theanthropogenic influence. In this study, we investigated the influence of AVOCon CCN activation and hygroscopic growth of BSOA. We investigated the SOA formationfrom monoterpenes and aromatics as representatives of BVOC and AVOC, respectively,by photooxidation in the large atmosphere simulation chamber SAPHIR in Juelich,Germany. The hygroscopicity factor kappa of BSOA was derived from CCNactivation and hygroscopic growth and compared with that of anthropogenic SOA(ASOA) and the mixture of ASOA and BSOA (ABSOA). Kappa was analysed in terms ofthe effect of oxidation (OH dose and O/C ratio of aerosol) and ASOA fraction. Wefound ASOA has an enhancing effect on the hygroscopicity of BSOA under sub-saturatedconditions. But it has only little effect under supersaturated conditions, i.e.ASOA has little effect on the CCN activity of BSOA. The reason of the seemingdiscrepancy is discussed. The effect of the interaction of AVOC with BVOC on clouddroplet activation kinetics is also discussed. Our findings have importantimplications for the understanding of the coupling of AVOC with biogenic VOC aswell as on assessing the radiative forcing of SOA.

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P2.9 - PEROXYNITRATES FROM TELOMERICS ALDEHYDES

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Peroxyacyl nitrates are irritatingcompounds formed by the oxidation of organic volatile compounds in presence ofNO2. They are important in atmospheric chemistry because of theirrole as a reservoir species of NO2 and radical peroxides. In On theother hand, fluoro-hydrogenated alcohols (CxF2x+1CH2CH2OH)are widely used in a range of industrial applications and lead to the formationof fluoro-hydrogenated aldehydes (CxF2x+1CH-

2C(O)H). These, in turn, could reactwith OH radicals and subsequently with molecular oxygen and NO2 to form CxF2x+1CH2C(O)OONO2.

In this study we present an atmospheric mechanism that leads to theformation of fluoro-hydrogenated peroxynitrates from C6F13CH2C(O)H anddetermine the thermal stability as a function of temperature and pressure of C6F13CH2C(O)Hand CF3CH2C(O)H. In order to obtain good quantities, they were synthetized in aglass flask, using black lamps (? > 330 nm) to initiate the oxidation fromchlorine atoms, and further purification peroxynitrates were obtained. Identificationof products and kinetics studies were performed using infrared spectroscopy.

The rateconstant for the thermal decomposition for C6F13CH2C(O)OONO2 1.2 × 10-4 s-1 is similar to the measured by the most abundantperoxynitrates in the atmosphere (PAN, PPN) having similar structure: 1.5 × 10-4and 1.6 × 10-4 s-1, respectively. On the other hand, the activation energy andpre-exponential factor for CF3CH2C(O)OONO2 at 9.0 and 1000 mbar are the following:108 ± 2 kJ/mol, 1.5 × 1015 and 114 ± 2 kJ/mol, 2.4 × 1016, respectively.

The highstabilities of CxF2x+1CH2C(O)OONO2 (x = 1,6) point out that the peroxynitratesformed with fluoro-hydrogenated aldehydes can act as reservoir species for NO2and CxF2x+1CH2C(O)OO radicals in the atmosphere.

P2.10 - MOLECULAR UNDERSTANDING OF NUCLEATION AT FREE TROPOSPHERIC CONDITION.

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Up to half of the aerosol acting as cloud condensation nuclei originates from aerosol nucleation. A field measurement at the high altitude research station, Puy deDome has been conducted during winter 2012. In addition to the standard equipment, we also used an API-tof, NAIS and PSM to measure ions composition, size distribution and nucleation rate. The puy de Dôme research station is located at 1 465m above sea level in central France (45:460 N, 2:57 0E). The needle shape of the puy de Dôme Mountain and the unusual very cold winter condition in 2012 allowed us to measure aerosol nucleation from boundary layer to free tropospheric condition. During this campaign nucleation processes have been observed in both conditions. Our measurements show for the first time molecular composition of the nucleated species at the limit of the free troposphere and the polluted atmosphere. In addition, we have performed measurement at the CLOUD chamber at CERN. The CLOUD experiment at CERN aims to study, undercontrolled conditions, nucleation processes as well as the effects of ions on nucleation. One campaign was carried out to study ion-induced and neutral binary nucleation of H2SO4 and H2O, for troposphericand stratospheric conditions. A comparison of these nucleation events with model and cloud data will be presented.

P2.11 - BIOGENIC SOA FORMATION THROUGH GAS-PHASE OXIDATION AND GAS-TO-PARTICLE PARTITIONING – COMPARISON BETWEEN PROCESS MODELS OF VARYING COMPLEXITY

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Biogenic volatile organic compounds (BVOCs) emitted by the vegetation play an important role for the aerosol mass loadings since the oxidation products of these compounds can take part in the formation and growth of secondary organic aerosols (SOA). The concentrations and properties of BVOCs and their oxidation products in the atmosphere are poorly characterized, which lead to high uncertainties in modeled SOA mass and properties. The aim of this study is to investigate the effect that different gas phase oxidation schemes, of various complexities, have on the modeled evolution of SOA at atmospheric conditions. SOA formation is modeled along an air mass trajectory over the northern European boreal forest using two aerosol dynamics box models. Both models are coupled to the near-explicit Master Chemical Mechanism version 3.2 (MCMv3.2) which is used when predicting the oxidation products of the BVOCs (here represented by a-pinene). This near-explicit treatment of organic gas-phase oxidation was compared to different oxidation schemes that use the volatility basis set (VBS) approach, in order to get an indication of the uncertainties and importance of different processes in the VBS regarding SOA formation. The result of the study shows that the modeled mass concentration of SOA is highly dependent on the organic oxidation scheme used to predict the oxidation products. The resulting SOA mass modeled with different VBS-schemes varies by a factor of about 7 depending on how the first generation oxidation products are parameterized and how they subsequently age (e.g. how fast the gas-phase oxidation products react with the OH-radical, how they respond to temperature changes and if they are allowed to fragment during the aging process). Since the VBS approach is frequently used in regional and global climate models due to its relatively simple treatment of the oxidation products compared to near-explicit oxidation schemes, a better understanding of the abovementioned processes are needed. The use of box model simulations can indicate which processes that need to be further studied in order to parameterize them better.

P2.12 - CHEMICAL AND TOXICOLOGICAL CHARACTERIZATION OF DIESEL AND BIODIESEL COMBUSTION EMISSIONS FROM VEHICLES USING A NEW CONTROLLED EXPOSURE CHAMBER FOR IN SITU TOXICITY EVALUATION: EQUIPMENT VALIDATION AND FIRST RESULTS

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The introduction of liquid biofuels in the energy matrix of a country entails newquestions about the quality of their emissions and their effect on the healthof people and environment. Ultrafine particles, volatile/semi-volatile organic andcarbonyls compounds concern mainly within vehicle emissions from diesel enginesassorted with biodiesel blends, for being the most detrimental to health.

Theaim of this study is the chemical determination of pollutants due to the vehicularemissions of diesel and biodiesels blends (D&BB), in addition to a genotoxicologicalevaluation based on the use of the biomonitor plant Tradescantia.

Oneof the most innovative aspects of this study is the use of a new automatedequipment called BioToxMonitor (patent pending), developed by CETAM-UTFSMthanks a R&D Fondef project. Theequipment consists in a series of isolated chambers in which biomonitor plantsare exposed to contaminant emissions from different origins, in this case from D&BBgenerated by a vehicle running on a dynamometer following the European Driving Cycle,in order to compare the genotoxicity resulting from D&BB.

Eachchamber also have a chemical sampling system consisting in automated thermaldesorption tubes (ATD) for ATD-GC-MS analysis of volatile organic compounds (VOCs) present inside the chambers. Particle size distribution will be performed usinga portable aerosol spectrometer to measure concentration of PM10, PM2.5, PM1.0and size distribution between 0.25-32 μm in 30 different channels (Grimm EDM107, Germany). In this way, BioToxMonitor allows to obtain a calibration curveand toxic equivalency, in order to set dose/response curves.

The application of this type ofenvironmental monitoring strategies in the analysis of fuel emissions, presentsa number of advantages, among which may be named: the mobile equipment allowsto perform in-situ studies, the possibility to obtain simultaneous information abouttoxicity of a complex mixtures of pollutants, reproducible and controlledexperimental conditions for the analysis of exhaust emissions, integratedchemical and toxicological information, among others.

All these aspects have directpositive impacts on the results assessment in the analysis of contaminantemissions, which are important for health and environmental politics.

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P2.13 - COMPARISON OF EMISSION FACTORS FOR PM2.5 AND PARTICLE SIZE DISTRIBUTION FROM THE COMBUSTION OF EUCALYPTUS GLOBULUS , NOTHOFAGUS OBLIQUA AND PINUS RADIATA USING CONTROLLED COMBUSTION CHAMBER 3CE

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In Chile, fuelwood consumption accounts 20% oftotal primary energy demand and is the main residential fuel. The main objective of this research is to determine Emission Factors (EF) forparticulate matter (PM2.5) and particles size distribution generatedby the combustion of Eucalyptus globulus (EG),Nothofagus obliqua (NO, both hardwoods) andPinus radiata (PR, softwood) at 0% humidity using the controlled combustionchamber (3CE) developed by CETAM-UTFSM (patent Nº843-2008, 2010 Chile, PCT/CL00058-2010 pending). 3CE is capable to take the totality of the emissiongenerated by the whole combustion process (PM and gases), without the use of adilution tunnel, to avoid artifact effect.

Combustion tests were performed using 10 g of wood (shavingsize) with an air flow of 21.3 Lmin-1 (?=2.32)and furnace temperature set at 120°C. Samples of combustion emissions weretaken from a collecting Tedlar bag using sampling cartridges containing quartzfiber filters.

High reproducibility was achieved between theexperiment repetitions (CV<10%, n=3); the EFPM2.5 for EG was 2.01±0.30 gkg-1, for NO 2.37±0.54 gkg-1 and for PR 1.5±0.32 gkg-1. Softwood contains lower concentration ofhemicelluloses in comparison with hardwood, and the formations of PM2.5depend of the concentration of hemicelluloses. This structure is degradedduring combustion to form concentrations of VOCs, which are transformed byphysico-chemical processes in the precursors of PM2.5. That canexplain because EFPM2.5 of PR is lower than those obtained by EG andNO.

Thanks the use of a laser aerosol spectrometer (0.25-34mm, Grimm-1.109, Germany) it was possibleto determine in real time the contribution of particle emission (PM2.5)in each stage of combustion process (SCP). The distribution of EFPM2.5 inignition, flame and smoldering phase was following: EG: 14%- 49%- 35 %, for NO:6%- 20%- 74% and for PR: 16%-47%-37%, respectively. The distributions of EFPM2.5 for thedifferent SCP depend of the wood type. It is not possible identify one unique SCPlike a most important emission phase for EFPM2.5, that is a veryimportant reason to justify to take the totality of the emission phases toavoid a underestimation of the EFPM2.5.

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P2.14 - VERTICAL PROFILES OF AEROSOL PROPERTIES AT THE MALDIVES CLIMATE OBSERVATORY HANIMAADHOO

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Aerosol radiative forcing is strongly dependent on the vertical distribution of aerosol particles. Remote sensing instruments like AERONET sun photometers give information about e.g. columnar aerosol optical depth (AOD) and single scattering albedo(SSA). In addition, surface based as well as space borne lidar measurements provide profiles of atmospheric backscatter and extinction. Meanwhile vertical in-situ aerosol measurements are rare but necessary to obtain profiles of actual particle concentration and corresponding aerosol particle properties.

We will present results from the Cloud Aerosol Radiative Forcing Dynamics Experiment (CARDEX),conducted at the Maldives Climate Observatory in Hanimaadhoo (MCOH) in February and March 2012. Highly polluted air masses transported from southern Asia were observed and investigated with several in-situ and remote sensing instruments during the dry monsoon season. The aim of the field campaign is to gain a deeper understanding of absorbing aerosols in the free troposphere over the Indian Ocean and its influence on clouds from an observational perspective.

With lightweightunmanned aerial vehicles (UAV) total particle concentration with Dp >10 nm, particle size distribution between Dp = 0.35 - 3.5µm as well as particle absorption have been measured. A mini micropulse lidar (MiniMPL), an AEORNET sunphotometer and regular surface measurements of aerosol physics and chemistry as well as meteorology at MCOH have been in use in parallel.

We propose a method to estimate a particle absorption profile from combined lidar and sunphotometer measurements. These are compared to actual measured absorption coefficients from an onboard Aethalometer and calculated absorption profiles based on total particle concentration, particle size distribution and relative humidity profiles. The results show good agreement between measurements and calculations.

Compared to similar measurements at the INDOEX campaign during February and March 1999, an increased and more variable total particle concentration above the boundary ayer (between 2 and 3 km) could be observed.

The wavelength dependence of absorption and scattering is used to distinguish the absorbing aerosol components (black carbon, organic material or dust). The estimations on absorbing aerosols can be related to the air mass origin and actual elemental carbon mass measurements.

P2.15 - APPLICATION OF A MODEL BASED SOURCE APPORTIONMENT TECHNIQUE TO TRACK FINE ORGANIC AEROSOL PARTICLES IN EUROPE.

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In the frame of EURODELTA3 (EDIII)European comparison exercise, we used the Comprehensive Air Quality Model with Extensions(CAMx) with the Particulate Source Apportionment Technology tool (PSAT) inorder to track the contribution to total aerosol organic mass below 2.5 μm from different emission sources at various locations in Europe.

High resolution data from four EMEP campaigns were used to compare the modelresults:
- 1 Jun - 30 Jun 2006
- 8 Jan - 4 Feb 2007
- 17 Sep - 15 Oct 2008
- 25 Feb - 26 Mar 2009

For the current study contributionto the total organic aerosol mass below 2.5μmfrom 11 SNAP codes and1 source area, i.e. the whole domain, have been tracked within the Europeandomain.

PSAT uses “reactive tracers” foreach specific source group categories (i.e. emissions group SNAP code) orsource areas (e.g. specific areas within the domain of simulation) to apportionup to 11 species of PM: SO42-, NO3-,NH4+, Hg, Secondary Organic Aerosol, Elemental carbon,Primary organic carbon, Crustal fine material, Crustal coarse material, Otherfine material, Other coarse material.

Results from PSAT were further compared with receptor model solutions(i.e. positive matrix factorization) and presented together with modelperformance indicators for selected pollutant over the European domain for thefour different EMEP filed measurement campaigns (i.e. total particulate matterbelow 2.5 μm and O3).

P2.16 - OCCURRENCE OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE SÃO PAULO ATMOSPHERE: A COMPARATIVE STUDY - WINTER 2012/2013

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Polycyclic Aromatic Hydrocarbons (PAHs) represent agroup of pollutants produced by the incomplete combustion of organic matter. Theyare found in an atmosphere impacted by vehicles, tobacco smoke, industries and otheremission sources. Several PAHs are regarded as priority pollutants by the USEnvironmental Agency due to carcinogenic and mutagenic potentials, presenting risksto the environment and human health. São Paulo Metropolitan Area is an importantindustrial complex and the city has a fleet of more than 7 million cars. Furthermore, São Paulo is the largestproducer of alcohol and uses biodiesel for heavy duty fleet. These differentfuels can impact the air composition in a way not yet understood. PAHs, OC andEC were determined for samples collected in two intensive campaigns done in thedry season (August 2012 and July/August2013). Particulate matter (PM10) was collected using a standard high-volume airsampler. The samples were extracted in ultrasonic bath and fractionated (aromatic and aliphaticcompounds). These fractions were subjected to gas chromatography–massspectrometry analysis and the aromatic fractions were identified and quantified.The 2012 and 2013 campaigns had PM10 mean concentrations of 41.54 µg m-3 and 104.98 µg m-3, respectively, and a total concentration of PAHs of 8.5 ng m-3 and21.6 ng m-3, respectively. The Benzo[a]pyrene-Equivalentcarcinogenic power is an index that indicates the health risk for ambient PAHsexposure. BaPE averages were 1.1 ng m-3 for 2012 campaign and 2.6 ng m-3 for 2013 campaign, values above 1.0 ng m-3 mean a significant cancerrisk; thus, the most recent campaign in the São Paulo citypresented a higher cancer risk. The OC and EC concentrations were also higherin the 2013 campaign (11.43 µg m-3 and 5.30µg m-3, respectively) than in 2012 (7.88 µg m-3 and 2.54 µgm-3, respectively). The 2013 campaign had lower TC/PM ratio (0.25for 2012 and 0.20 for 2013), and higher EC/TC ratio (0.24 for 2012 and 0.31 for2013). Considering the ratios ofPAHs, OC and EC, the organic compounds in the PM10 can be ascribedto vehicular exhaust and also to long-range transporting of sugarcane burning aerosol.

P2.17 - EFFECTS OF AEROSOLS ON SATELLITE MEASUREMENTS OF HCHO COLUMNS

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Formaldehyde (HCHO) vertical columns measured by the satellites have been useful to constrain non-methane volatile organic compounds emissions especially from biogenic sources. However, the satellite observations are known to be very sensitive to air mass factor (AMF) that converts slant column density (SCD) to vertical column density (VCD). AMF is typically obtained from the radiative transfer calculations accounting for the extinction of solar radiation by the atmospheric constituents. Here we examine the effect of aerosols on AMF and satellite measured HCHO VCDs in East Asia. We first use a synthetic simulation approach by combining a global CTM (GEOS-Chem), a radiative transfer model (VLIDORT), and a HCHO retrieval algorithm to validate our retrieval algorithm. We then examine the sensitivity of the HCHO retrieval to the presence of aero-

sols and the temporal variability of hourly and monthly AMF values. Our analysis shows that the retrieved HCHO VCDs with the hourly AMF are in excellent agreement with the true values (R2=0.99) while those with the monthly averaged AMF yield a bit degraded correlation (R2=0.87), showing an important implication for measurements by planned geostationary satellites. We also apply AMF considering aerosols to OMI standard SCDs to quantify the aerosol effects on HCHO retrievals. A comparison with the OMI HCHO VCDs shows 20 % difference primarily due to the consideration of aerosols in AMF, indicating an important role played by aerosols for the satellite measured HCHO.

P2.18 - METHANE PROFILE OVER SOUTH AMERICA DURING THE BURNING SEASON: SATELLITE OBSERVATION AND AIRCRAFT VALIDATION IN THE LOWER TROPOSPHERE

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The methane (CH4)is a long-lived greenhouse gases and a few important trace gases present in theatmosphere with enough of a spectral signature to be observed from a spaceplatform. In general, globalmeasurements of atmospheric CH4 concentrations continue to show largeinterannual variability whose origin is only partly understood. Spacebornemeasurements by the Atmospheric Infrared Sounder (AIRS) on the EOS/Aquasatellite provide a global view of the CH4 distribution in the troposphere. TheAIRS channels near 7.6 μm are used for CH4 retrieval, and they are mostsensitive to the middle to upper troposphere. This work presents thevariability of CH4 over South America during the last ten years in the middleto upper troposphere and the validation of retrievals of atmospheric CH4vertical profiles by the AIRS. The validation study examines the verticalprofile of CH4 in the Central Region of Brazil during the burning season usingAIRS retrievals and aircraft measurements in the lower troposphere. Data fromOctober of 2007 focusing over the city of Alta Floresta, State of Mato Grosso,was analyzed. The operational products in V5.0 and V6.0, AIRS CH4 werevalidated using in situ aircraft observations. The validation of AIRS CH4products versus aircraft profiles demonstrates that operational productsin V5.0 and V6.0 are very similar in the lower troposphere and its error ismostly less than 10%. These validation comparisons can provide criticalassessment of the retrieval algorithm. In terms of concentration, the satelliteretrievals of CH4 using the AIRS on the EOS/Aqua platform from 2003–2010 overBrazil show a weak seasonal variability, with the maximum occurring inAugust/October.

P2.19 - SECONDARY ORGANIC AEROSOL FORMATION AND AGING THROUGH AQUEOUS PHASE GUAIACOL PHOTONITRATION

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One of the largest primary sources of organic aerosol in the atmosphere is biomass burning1. During the process of wood burning thermal degradation of the wood lignin occurs and various degradation products (e.g. methoxyphenols) are formed, which generally preserve their original substituents on the aromatic ring. Taking into account physical properties of these compounds and their distribution from the gas phase only, the concentration of methoxyphenols in the atmospheric waters might be underestimated. Thus, aqueous phase reactions can be an additional source of secondary organic aerosol (SOA), especially in regions under significant influence of wood combustion.

Studies of aqueous phase reactivity of methoxyphenols are rather scarce2, although aqueous phase photonitration of aromatics has been suggested to be of a considerable importance for the formation of often toxic nitroaromatic compounds in the atmosphere3. Such a nitration pathway was also proposed for the formation of nitroguaiacol derivatives found in winter PM10 samples from Ljubljana, Slovenia4. Very recently, nitroguaiacols were detected in SOA as a result of chamber gas phase oxidation of guaiacol under high-NOx conditions5.

In the present study the formation and aging of SOA through aqueous phase photonitration of guaiacol (2-methoxyphenol), which is being emitted to the atmosphere during softwood burning, was studied. The aqueous reactions were performed in a thermostated reactor under the well-defined experimental conditions. The solution of guaiacol was held in dark or exposed to the simulated sunlight (Xenon lamp, 300 W) in the presence of H2O2 and $NO2^-$ and the reaction was monitored up to 44 hours. Guaiacol and its main first and second generation nitro-products, i.e. 4-nitroguaiacol, 4-NG; 6-nitroguaiacol, 6-NG; and 4,6-dinitroguaiacol, 4,6-DNG, which have been just recently chemically characterized by Kitanovski6, were followed by use of a high pressure liquid chromatography (HPLC). On the basis of the reaction kinetics at different conditions the mechanism of guaiacol nitration in the atmospheric waters was proposed.

References:
1. Laskin, A. et al. (2009) Environ. Sci. Technol. 43, 3764-3771.
2. Chang and Thomson (2010) Atmos. Environ. 44, 541-551.
3. Vione, D. et al. (2003). Environ. Sci. Pollut. Res., 10, 321-324.
4. Kitanovski, Z. et al. (2012) J. Chromatogr. A 1268, 35-43.
5. Lauraguais, A. et al. (2014) Atmos. Environ. 86, 155-163.

6. Kitanovski, Z. (2013) Doctoral Dissertation.

P2.20 - HORIZONTAL AND VERTICAL (3D) DISTRIBUTION MEASUREMENTS OF TRACE GAS RATIOS AS INDICATOR FOR ANTHROPOGENIC/BIOGENIC VOC INFLUENCES ON OZONE/AEROSOL FORMATION RATES

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The oxidation of Volatile Organic Compounds (VOCs) inpresence of Nitrogen Oxides (NOx) leads to the formation of Ozone (O3) andsecondary organic aerosol (SOA). The atmospheric VOC oxidation chemistry alsoleads to the formation of oxygenated VOCs (OVOCs) such as formaldehyde (HCHO)and glyoxal (CHOCHO) as key intermediates from both anthropogenic (AVOC) andbiogenic (BVOC) hydrocarbon oxidation. Recently, the ratio of CHOCHO to HCHO (RGF) has been proposed as ametric to infer and distinguish AVOC and BVOC emissions from satellites (Vrekoussis et al., 2010) and in-situ ground-basedmeasurements (DiGangi et al., 2012). Satellitestudies show RGF between 0.04-0.06 in the biogenic emissions dominantregions such as tropical forests in South America and Africa, while RGFvalues smaller 0.04 are indicative of anthropogenic air masses (Vrekoussis etal., 2010). In contrast, DiGangi et al (2012) reported a RGF smaller0.04 for measurements over Pinus Ponderosa forests in California and Colorado.There has been little/no discussion on this important discrepancy between thesatellite and in-situ observations. Further, the ratio of HCHO to nitrogendioxide (NO2), RFN, has been proposed as a metric to investigate theVOC vs NOx limitation of Ozone formation rates (Duncan et al., 2010). We have measuredRGF and RFN by means of the 2-dimensional Multi-Axis-Differential Optical Absorption Spectroscopy (2D-MAX-DOAS) instrument developedat the University of Colorado at Boulder. The instrument measures HCHO, CHOCHOand NO2 in 3-dimensions by collecting solar scattered photons in asequence of azimuth and vertical profile scans. By measuring RGF andRFN in 3 dimensions 2D-MAX-DOAS links satellite and in-situ spatialscales and maps gradients in both ratios across a ground-site. We will presenta comprehensive overview about RGF and RFN measurementsfrom recent our field campaigns in urban, rural, and pristine Pacific RemoteOcean, and discuss the use of RGF and RFN measurements asindicators for AVOC/BVOC influences on O3/aerosol formation rates.

P2.21 - EVOLUTION OF THE COMPLEX REFRACTIVE INDEX IN THE NEAR UV SPECTRAL REGION IN AGEING SECONDARY ORGANIC AEROSOL

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The chemical andphysical properties of secondary organic aerosol (SOA) formed by thephotochemical degradation of biogenic and anthropogenic volatile organiccompounds (VOC) are yet poorly constrained. The evolution of the complexrefractive index (RI) of SOA, formed from purely biogenic VOC and mixtures ofbiogenic and anthropogenic VOC was studied over a diurnal cycle in the SAPHIRphotochemical outdoor chamber in Jülich, Germany. The correlation of RI withSOA chemical and physical properties such as oxidation level and volatility wasexamined. The RI was retrieved by a newly developed broadband cavity enhancedspectrometer for aerosol optical extinction measurements in the UV spectralregion (360 to 420 nm). Chemical composition and volatility of the particleswere monitored by a high resolution time of flight aerosol mass spectrometer,and a volatility tandem differential mobility analyzer. SOA was formed byozonolysis of either (i) a mixture of biogenic VOC (a-pinene and limonene),(ii) biogenic VOC mixture with subsequent addition of an anthropogenic VOC(p-xylene-d10), or (iii) a mixture of biogenic and anthropogenicVOC. The SOA aged by ozone/OH reactions up to 29.5 hours was found to benon-absorbing in all cases. The SOA with p-xylene-d10 showed anincrease of the scattering component of the RI correlated with an increase ofthe O/C ratio and with an increase in the SOA density. There was a greaterincrease in the scattering component of the RI when the SOA was produced fromthe mixture of biogenic VOCs and anthropogenic VOC than from the sequentialaddition of the VOCs after the approximate same ageing time. The increase ofthe scattering component was inversely correlated with the SOA volatility. TwoRI retrievals determined for the pure biogenic SOA showed a constant RI for upto 5 h of ageing. Mass spectral characterization shows the three types of the SOAformed in this study have significant amount of semivolatile components. The influence of anthropogenic VOCs on theoxygenated organic aerosol, and the atmospheric implications are discussed.

P2.22 - HOW MUCH CAN WE LEARN ABOUT NITROUS OXIDE EMISSIONS FROM BASELINE SITES AND SIMPLE BOX MODELS?

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Atmospheric nitrous oxide (N2O) is an important ozone-depleting gas that continues to rise in concentration even as CFC emissions have virtually ceased.It is also a potent greenhouse gas with a global warming potential of 298 timesper molecule that of carbon dioxide with 100 years time horizon. NOAA has been monitoring background concentrations of N2O from weekly flask sampling since 1977,starting with five remote stations over a broad latitudinal coverage from Pt.Barrow, Alaska to South Pole. This network has expanded to thirteen flask sites and six in situ instrument sites. We have combined data from the collocated,ground-based sites using three different independent instruments all linked tothe WMO N2O calibration scale, primarily to assist in quantifyingthe global burden of atmospheric N2O for international assessments of the state of the science in climate and stratospheric ozone depletion. We have combined data from the collocated,ground-based sites using three different independent instruments all linked tothe WMO N2O calibration scale, The growth rate of atmospheric N2Ohas been constant at 0.78±0.01(3s) parts per billion (ppb) per year over the period, but with important deviations related to ENSO, transport,and changes in patterns of emissions. Recent studies using a combination of multiple atmospheric networks and different Global Climate Models (GCMs) wereused to calculate estimate emissions, even down to emission values for individual countries and sources. Slight calibration differences between networks of a few tenths of a ppb can have significant effects on the emissionscalculated by these methods. Our approach is to use one calibration scale for our flask and in situ networks within different GMD groups with simple box models to examine the locations ofthe emissions.

P2.23 - FINE AND COARSE PARTICLES CONCENTRATION MEASURED DURING 2013 IN THE METROPOLITAN AREA OF SÃO PAULO.

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The Metropolitan Area of Sao Paulo, MASP, hasapproximately 20 million inhabitants and more than 7 million vehicles runningon diesel (for heavy-duty vehicles), gasohol (a mixture of gasoline with 22%ethanol), and hydrated ethanol. MASP has an area of 8051 km2. According to the official emissions inventory for São Paulo morethan 85% of CO, VOC, and NOxemissions are derived from mobile sources. MASP suffers with air pollution problems, mainly associated to fineparticles and ozone. In MASP the air pollution has worsened due to thecumulative effects of population growth, industrialization and increasedvehicle use. Since 2013 was established an air quality standard for fineparticles in the São Paulo State. The temporal variation of its concentrationand composition has been measured in different years. But in 2013, 248 sampleswere collected continuously with a Dichotomous sampler in order to have thePM2.5 and PM2.5-10 mass and trace-elements characteristics and concentration,including the Black Carbon evaluation. The samples were collected on PTFE membranes and were analyzed by X-Rayfluorescence to determine the trace-elements composition and concentration. Themass was measured by means of the microbalance. The PM2.5 concentration was (18±12 μg/m3) and PM2.5-10 concentration was (15±9 μg/m3). ThePM2.5 mass concentration explains

55% of the PM10 and has a Pearson correlationof 0.95 (significance level of $p<0.05$) with PM10. PM2.5-10 presented acorrelation of 0.72 (significance level of $p<0.05$) with PM2.5. Thecorrelation between fine and coarse particles is associated to the influence ofmeteorological variables, mainly wind and precipitation. The mean relativehumidity during the sampling period was 77%. Wind velocity presented thehighest negative correlation with the fine particles concentration (-0.45), andmuch less with coarse particles (-0.16). The reason is that the wind is moreefficient in dispersing the fine particles. Black Carbon concentration wasevaluated with a refletometer.

P2.24 - OBSERVATIONS AND MODELING OF ATMOSPHERIC CHEMISTRY OVER NORTHEASTERN BRAZIL AT THE FEDERAL UNIVERSITY OF RIO GRANDE DO NORTE

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Little is known about atmospheric chemistry conditions over the large northeastern region of Brazil(NEB). NEB is coverd by atlantic rainforest close to the coast, the unique Caatinga biome in a large part of its interior and by Cerrado wooded savanna inthe west. NEB is being subject to large changes in the last years, due to urban growth of the different state's capitals, strong increase in the vehicular fleet and intensive development and use of agricultural areas, converting the natural vegetation into pasture and other agricultural land, and changing its landuse. As a consequence, emissions from vegetation, soil and anthropogenic processes associated to their management are severely affected. Experimental data is virtually non-existent over the area, except for some very local studies on aerosols and trace gases that are regionally not representative neither on spatial nor temporal scales. Sparse regional information on emissions does not rely on regional knowledge or statistical data, lack transparency in methodology and are thus not comparable between the different states of the NEB. The same counts for global emission inventories that feature very different numbers for the regionand were never validated with local data.

To improve our knowledge on atmospheric chemistry and associated processes over NEB, a new research group was very recently founded at the Federal University of Rio-Grande do Norte (UFRN): The Research Group on Observations and Modeling ofAtmospheric Chemistry (MOQA). The group is part of the Department of Atmospheric and Climate Sciences of the Center for Natural and Earth Sciences(CCET) at UFRN. The objective of the MOQA group is to tackle these large knowledge gaps for the region by (i) improving existing regional emission inventories, (ii) plan and participate inmeasurement activities of fluxes and concentrations of trace gases andaerosols, (iii) adapt and apply modeling tools of atmospheric chemistryreactions, transport and deposition over the region, (iv) assess air quality information over the main urban centers, (v) study effects of air pollution onthe population in terms of health and climate aspects. Here, we present the ongoing and planned activities of our research group together with our collaborators.

P2.25 - THE HYGROSCOPICITY OF ATMOSPHERIC AEROSOL PARTICLES AND THE RELATION TO THE PRESENCE OF CLOUD CONDENSATION NUCLEI OVER A FOREST SITE IN JAPAN DURING SUMMER

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Formationof new particles and the growth by condensation of secondary organic aerosol (SOA) components could be important for the formation of cloud condensation nuclei (CCN) in the forest atmosphere. In this study, the hygroscopic growth factors (g) of aerosol particles and the size-resolved ratios of CCN to condensation nuclei (CN) were measured, respectively, using a hygroscopicity tandem differential mobility analyzer (HTDMA) and the combination of a CCN counter (CCNC) and a condensation particle counter at aforest site in Wakayama, Japan. The number-size distributions and chemical composition of aerosols were also measured at the site.

The observed hygroscopic growth of aerosol particles is characterized by the unimodal g distributions. On the days with new particle formation (NPF) events, the g distributions in the daytime(0900-2100 local time (LT)) and those in the nighttime (2100-0900 LT) were largely different. On the event days, whereas the mean values of g of particles in the Aitken mode range at 1200-2100 LT were small (~1.1), the values at 0000-0900 LT were large (~1.3, except for the value at 24nm). The number fraction of CCN also changed; the ratios of CCN to CN at 0.2% supersaturation were small in the beginning of the events (mean: 4%) and the ratios were large in the nighttime (mean: 36%). The differences of CCNC-derived hygroscopicity parameter kappa from HTDMA-derived kappa at 50, 100, and 200 nm were within 20%. The CCN number concentrations (NCCN) predicted from the hygroscopic growth data agree well to NCCN calculated from the size-resolved ratios of CCN to CN, demonstrating the usefulness of the size-resolved hygroscopic growth data to predict the presence of CCN.

The kappa of organics (kappaorg) at 50, 100, 200, and 359 nm in the daytime on the NPF event days were calculated to be on average 0.11, 0.17, 0.20, and 0.26,respectively. The kappaorg at 50, 100, and 200 nm were ~30% lower than those on non-event days, suggesting that the formation of biogenic SOA lowered kappaorg substantially. By contrast, the difference of kappaorg at 359 nm on the event days from that on non-event-days was ~10%.

P2.26 - REGIONAL DISTRIBUTION OF GLYOXAL OVER THE SOUTHEASTERN U.S.: FIRST HIGH RESOLUTION, IN-SITU AIRBORNE MEASUREMENTS

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Glyoxal (CHOCHO) is an indicator of the oxidation processesof volatile organic compounds (VOCs) in the atmosphere. It has been proposed toplay an important role in secondary organic aerosol formation (SOA) due to itshigh water solubility and oligomer forming ability. However the knowledge of underlyingmechanisms is still limited. In addition, the enhanced CHOCHO signal observedby satellite instruments in equatorial regions indicates our insufficientunderstanding on source processes of CHOCHO. To date, no previous in situ CHOCHO observations have beenavailable from aircraft owing to the difficulties in ambient levels of detection.

In support of the scientific goals of SENEX 2013 (SoutheastNexus) to investigate the role of anthropogenic and natural emissions in ozoneand aerosol formation and their climate impact, we developed the AirborneCavity Enhanced Spectrometer, ACES. This instrument provides rapid, sensitive in situ measurements of CHOCHO and othertrace gases important in tropospheric oxidation chemistry, such as NO2and HONO. The presentation will include a brief description of the working principleand performance of the new ACES instrument.

We presentthe first in situ CHOCHO map oversoutheast US. The region is strongly influenced by emissions of isoprene, whoseoxidation is a major CHOCHO source. Theregion also has large anthropogenic emissions from urban and power plant plumesthat may influence isoprene oxidation and glyoxal formation. Finally, we sampled several air massesheavily influenced by emissions from shale gas extraction. We examine thegeographical distribution of glyoxal across a range of different air masses. Thecontrast between these air masses, together with 0-D box modeling calculations usingexplicit VOC degradation mechanisms (MCM3.2v), allow us to assess CHOCHO formationprocesses from oxidation of different VOCs together with CHOCHO sink mechanisms,including photochemical degradation and aerosol uptake. The results will becompared with recent results from similar measurements in other regions, suchas urban area (Los Angeles, CA) and a remote oil and gas producing area in Utah.Vertical profiles of CHOCHO, which are useful for satellite validation, as wellas yields of CHOCHO from pyrogenic emission from biomass burning plumes will bepresented.

P2.27 - COMPLEX GREENHOUSE GAS MONITORING AND RESEARCH PROGRAMS AT A WMO GAW TALL TOWER SITE IN CENTRAL EUROPE

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The poster presents the monitoring and research programs performed at the tall tower GHG monitoring site of Hungary (Hegyhátsál, 46°57'N, 16°39'E, 248 masl), member of WMO GAW network. The monitoring site is located in a rural environment, far away from major anthropogenic pollution sources. Continuous CO2 mole fraction measurements at four elevation levels (10 m, 48 m, 82 m and 115 m) since 1994 and aircraft measurements between 2001 and 2008 provided information on the long term trend of CO2 concentration, on its vertical distribution in the atmospheric boundary layer and on the effect of regional scale climate fluctuations on the overall trend. Since 2006 CH4, N2O and SF6 concentrations are also measured at the site. Eddy covariance (EC) system mounted at 82 m above the ground gives information on the CO2 exchange, and on its temporal variation, of the surrounding typical, mixed agricultural region. The poster presents the relation of the regional weather and the annual net ecosystem exchange (NEE). In-field experimental data show that ecosystems may become significant net CO2 sources under unfavorable climate conditions, although they are predominantly form a net CO2 sink on annual scale from the point of view of the atmosphere at present. While these measurements can be considered regionally representative, and in this sense they are unique among the common EC based NEE measurements, another EC system at the site mounted at 3 m above the ground monitors the CO2 exchange of semi-natural grass. The two EC systems provide the experimental background for the development of process-oriented ecosystem models capable to handle also land management and to predict NEE (and other important carbon balance components) under future climate conditions. Since 2008 monthly integrated atmospheric CO2 samples have been taken for carbon isotope measurements. Radiocarbon (14C)measurements show us the monthly average ratio of CO2 of biospheric and of fossil origin for the better evaluation of the anthropogenic influence on the atmospheric carbon budget in this densely populated, highly industrialized region of the world.

P2.28 - TRANSPORT AND DISPERSION OF TROPOSPHERIC OZONE AND ITS EFFECTS ON THE SECONDARY METABOLISM OF TIBOUCHINA PULCHRA (CHAM.) COGN. IN THE METROPOLITAN AREA OF VALENCIA - SPAIN

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Alongside the problems caused by air pollution which are widely exposed in the media, it is also of great concern the interference of some atmospheric pollutants in growth and development of tree species. Among all the pollutants, ozone, which presents toxicity at lower atmospheric layers, has being studied in the last decades by a lot of researchers all over the world.

Like other urban centers, metropolitan region of Spain offers special meteorological and geographical condition that provides the photochemical reactions responsible for tropospheric ozone formation. Thus, the Spanish government has developed some tools to ensure monitoring and decreasing ozone levels. In the metropolitan area of Valencia and cities nearby, there is an example: a large atmospheric pollution monitoring network which includes approximately 50 stations spread along cities with distinct socioeconomic and geographical features. The data collected in these areas are published periodically in the official website ofConselleria de Infraestructuras, Territorio y Medio Ambiente, and since they are public, it was possible to analyze transportation and dispersion of ozone in Valencia throughout a graphical utility problem such as the one used in that work: HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) software. With HYSPLIT it was possible to calculate the dispersion of a pollutant by assuming either puff or particle dispersion. The puff model – considered in that work – outstands that the puffs expand until they exceed the size of the meteorological grid cell (either horizontally or vertically) and then split into several new puffs, each with it’s share of the pollutant mass.

Another focus of this work was the evaluation of some secondary metabolites in samplings of a Brazilian tree species, Tibouchina pulchra, an ozone bioindicator, native on Atlantic Rain Forest. The analyses demonstrated the risks the tree species, inhabitants of metropolitan area of Valencia and its surroundings are crossing over, which are larger in hot seasons, especially in Summer, when ozone levels increase and the restriction of exposure to ozone imposed by laws are often exceeded. Regarding the secondary metabolism of T. pulchra, it was observed a variation in phenolic compounds: some of them demonstrated a tendency to increasing (anthocyanins), and others decreased (tannins) after ozone exposure.

P2.29 - STOCHASTIC AND ARTIFICIAL INTELLIGENCE MODELS FOR FORECAST RESPIRABLE PARTICLES (PM2.5) ATMOSPHERIC IN DIFFERENT ZONES OF METROPOLITAN AREA OF RIO DE JANEIRO

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Particulate matter less than 2.5 μm in diameter (PM2.5)has been considered an atmospheric pollutant associated with health problems, because it is more probability to penetrate the respiratory system. The environmental legislation in Brazil establishes air quality standards for PM10 (particulate matter less than 10 μm) and TSP (particulate matter less than 100 μm), but still there is not standard for PM2.5. However,the World Health Organization (WHO) recommends air quality limit for PM2.5, based on the known health effects, to short and long-term. Thepresent study aimed estimate the concentration levels of PM2.5 inthree sites with different features in the metropolitan region of Rio de Janeiro State, Brazil, to allow environmentalagencies to make decisions before of the forecast occurrences.The regions adopted were Seropédica,with rural characteristics, Duque de Caxias, representing an industrial zoneand Taquara, an urban feature. Samples were collected during 24 h every sixdays from January/2011 to December/2013. The average PM2.5concentrations ranged from 1 to 65 μg m-3 for all sites, exceedingthe recommended annual limit of WHO (10 μg m-3). According to themethodology of neural network it was possible to evaluate the behavior of thepollutant in the studied areas, from meteorological parameters such as windspeed and direction, temperature, relative humidity, and atmospheric pressure. Holt Winters and Neural Networks models were createdto the input layer with the amount of lags suggested by the auto-correlationfunction to PM2.5 forecast. Moreover, the neural networks were also designedwith the addition of other relevant meteorological variables. The root meanssquare error (RMSE) was calculated for the three proposed models and each threesites. The results applying Holt Winter model presented RMSE between5,8-14,9 μg m-3, the neural network using only time series of thePM2.5 concentration showed RMSE between 6,2-11,9 μg m-3. Finally, the neural network using all variables, including meteorological, was the best model with RMSEwas between 4,2-9,3 μg m-3.

P2.30 - SO2 MEASUREMENTS IN AMAZONIA AND ITS RELATIONSHIP WITH AEROSOL PROPERTIES

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Sulfur dioxide (SO2) is the predominantanthropogenic sulfur-containing air pollutant, resulting in acid precipitationand impacting soil, water and vegetation. It is also a precursor of sulfateaerosols and, together with amines and volatile organic compounds (VOCs), actsin the process of atmospheric new particle formation. In its turn, aerosolsinteract with solar radiation, with impacts over climate and cloudmicrophysics. In pristine Amazonian areas, SO2 is produced throughthe oxidation of biogenic H2S and DMS, emitted from soil and vegetation.The last SO2 observations reported for pristine Amazonian areas arefrom the 1980’s, indicating mixing ratios in the order of 20 ppt. Suchmeasure-

ments are scarce, in part because of its challenging low mixing ratios. InAmazonian areas affected by biomass burning, reports from the 2000's have showedSO2 in the order of 100 ppt. Since then, sprouting urbanization inthe Amazon region has brought changes to the atmospheric composition, justifyingthe need to further characterize SO2 levels and its relationshipwith aerosol composition. Here we report SO2 measurements from two distinctAmazonian sites: the first site is right in the outflow of Manaus city urbanplume (TIWA site); the second one is in a forest reservation in EasternAmazonia (tower site km67 in Pará State). Observations at the first siteindicated average SO2 mixing ratios of 500 ppt, with peaks reaching upto 2 ppb. Simultaneous aerosol size distribution measurements showed a profusionof ultrafine particles (diameters below 30 nm), which is uncommon in Amazonianpristine areas. The combination of relatively high SO2 levels with widespreadbiogenic VOCs like isoprene and monoterpenes, emitted from forest areas, may increasesignificantly secondary aerosol production. We discuss if SO2 couldbe a limiting factor for the occurrence of new particle formation in pristineareas of Amazonia. Moreover, the relationship between SO2 levels,aerosol composition and particle optical properties will be investigated.

P2.31 - AIR QUALITY AND ECOSYSTEM EFFECTS OF VARYING AGRICULTURAL ATMOSPHERIC AMMONIA EMISSIONS IN THE UNITED STATES

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Modern agricultural practices represent asignificant perturbation to nitrogen cycling in the Earth system. Thecorresponding effects on air quality and ecosystems are complex and requirefurther investigation. A key uncertainty in our understanding of these effects isthe variable timing and magnitude of ammonia emissions, which is poorlydescribed in models and emission inventories. The goal of this work is to identifyrelationships between observed variations in ammonia concentrations and possiblecontrolling factors (both meteorological and land use) over the United States inorder to develop better emissions descriptions for modeling. We focus ourinitial analysis on the United States. We investigate the links between fiveyears (2008-2012) of a new ammonia column concentration product derived from theInfrared Atmospheric Sounding Interferometer (IASI) satellite instrument and observationsand reanalysis of meteorological parameters like temperature and precipitation andmore complex indicators such as soil moisture and vegetation cover. We developsimple relationships that we use to locally scale emissions in the GEOS-Chemchemical transport model. We theninvestigate how these improved emissions schemes impact the ability of themodel to reproduce the variability in surface observations of particulatematter concentration and nitrogen deposition.

P2.32 - PHENOL AND NITRO PHENOLS IN DOWNTOWN SANTIAGO

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maria.rubio@usach.cl Santiago is one of the most polluted cities in the world. In winter, adverse weather conditions, concentrating gases and particulate matter at low altitudes. In this scenario, the concentrations of gaseous and particulate materials often exceed the air quality standard. In summer, due to higher temperatures the weather conditions improve, however increased solar radiation promotes photochemical pollution. Phenols and nitro phenols are present in the atmosphere both in summer and winter, in particulate matter and in the gas phase. They constitute an important family due to their toxicity and some of them are considered priority pollutants by EPA. The phenol and nitro phenols can be primary (combustion) and /or secondary pollutants (photochemical processes). Their distribution and concentrations along the day, in air and in cars exhausts could give interesting regarding the relevance of mobile source emission.Air sampling (at West of the central area of ??Santiago) and exhaust gases of gasoline and diesel vehicles, sampling were make during April 2013 to January 2014, aspirating / min of air into cartridge solid phase extraction. The separation and quantification of phenols and nitro- phenols was performed by HPLC technical (Water 600 with PDA detector). The daily profiles (concentration based on time of day) of phenol showed good correlation with carbon monoxide noting that have a common source , i.e. are emitted by vehicles and mobile sources. 4-nitro phenol and 2-nitro phenol showed no correlation with CO, and obtained daily profiles were not determining their origin. Finally we conclude that phenol is emitted into the atmosphere by vehicles with gasoline engine, while 2-nitro phenol and 4-nitro phenols are emitted by a diesel vehicle. Reference: Elshorbany et al. Atmospheric Environment 43: 6398-6407, (2009)Acknowledgements. Fondecyt project: 1120366

P2.33 - IMPROVING AIR QUALITY IN SANTIAGO, CHILE

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Some areas of the Metropolitan Region of Chile exceed the national standard of an 8-hourmobile average of 120 μg/m3N, especially during summer months. Theformation of ozone in cities is due, atleast in part, to the presence ofurban vegetation. Santiagois clearly deficient in vegetation in a large part of the city. WHO recommends9m2/inhabitant of ??green space for urban areas. A great difference exist betweenthe poorest communes (range 2.9to 0.4 m2/inhab) and between 6.7 to 18.8 form2/inhab for the higherincome communes. In 2009 the meanvalue reported was 3.9 m2/inhabitantwith extreme values ??of 1.1 and 12.6 m2/inhab.

A sampling of nine exotic and sixnative species was selected. These tree species represent around33% of urban trees in the Metropolitan Region; they grow and were in situ sampled on the North Campus ofthe Universidad de Chile, (33.5° Lat S y 70.6° Long W) Santiago, during australspring and autumn.

Anemissions inventory of air pollutants made for Santiagoin 2010 based on taxonomic associations was 19,248 t/year of biogenic volatileorganic compounds (BVOCs). The modeledresults correspond to 19.1% isoprene,26.1% monoterpenes, and 54.8% for other BVOCs. Biogenic emissions inventories are builtusing emission factors(EF), which are an approximation of thecharacteristic behavior of gaseous chemical compounds of each plant species ina certain time and area.

Resultsshow evidence that most of the native species studiedemit lower concentrations of potentially ozone-forming chemicalcompounds, have much lower EF, and have much lower PhotochemicalOzone Creation Index. Results also show that 8.700 t/yearcalculated by the emission inventoryexceeds 53.6% theannual emission resulting withthe introduction of the experimental EF from fifteentree species; these changes toinventory show the overestimationof BVOCs considered from native vegetation and at the same time an importantreduction of the total emissions ofVOCs. These results should be taken into account when strategies andactions are designed to improve air quality. At the same time,native trees, mostly evergreen, havebetter qualities, such as roughness,surface villi orresin, for retention of particulatematter.

P2.34 - EFFECT OF THE GOTHENBURG PROTOCOL MEASURES ON NMVOC EMISSION AND CONCENTRATION LEVELS IN THE CENTRAL EUROPE

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In 1999, the Gothenburg protocol (under CLRTAP) to Abate Acidification, Eutrophication and Ground-level Ozone sets emission ceilings for 2010. European NMVOC emissions were expected to be cut by at least 40% compared to 1990. Between 1990-2011, NMVOCs emissions in EU dropped by 59%. In the Central European region, the most significant decrease was found in (68%). The values for the (55%), (53%) and (49%) were in line with the Gothenburg ceilings. Only the drop in (22%) was not sufficiently significant. In 1992, the EMEP programme under CLRTAP started NMVOC monitoring at selected stations including the Observatory Košetice (49°35´ N; 15°05´E; a.s.l), operated by CHMI (Czech Hydrometeorological Institute). In 1995, CHMI started the same type of measurement at the Libus station (50°00´ N; 14°27´ E; a.s.l), which represents the suburban area of the capital . Since 2011, NMVOC measurement is involved in ACTRIS (Aerosols, Clouds, and Trace gases Research Infrastructure Network) EU7 project. The main tasks is to establish sustainable observation network across Europe and to implement standardised measurement protocols and common European calibration scales for NMVOCs to support of the EMEP and GAW strategy. In general, the reduction of NMVOCs emissions in last 2 decades was reflected in essential decrease of concentrations at both regional and suburban level. The nonparametric Mann-Kendall method was used for statistical evaluation of trends significance. The most significant downward trend was found for almost all of measured NMVOCs at both stations. The ethane trend was more significant at suburban site than at the background level. The most important biogenic NMVOC isoprene is controlled mostly by natural conditions and shows different patterns as other NMVOCs. No significant trend was found under the period under review at Košetice and slightly increasing trend was detected at Libus. The concentrations at the suburb level were higher by 150-200% than at the background site in the nineties. In the last decade, the difference between suburban and background level was smaller, thanks to the considerable reduction of anthropogenic emissions.

P2.35 - VARIATION IN AMBIENT CARBONYLS IN BEIJING : 2005- 2012

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Carbonyls, coming from both primary and secondary sources are important precursors of secondary air pollutants. To better understand the role in air pollution in Beijing, we explored the variation of ambient carbonyl levels based on ground-based measurements. The measurements indicated a decreasing at rate of 0.65 ppb/yr for formaldehyde concentrations in summer and an increasing at rate of 0.31 ppb/yr in winter. Acetaldehyde decreased in both seasons, acetone increased slightly at PKU site in summer. The sources that driven the carbonyl variation were investigated based on three factors, the emission of carbonyls, the emission of precursors for carbonyls production, and the degree of photochemical aging. Formaldehyde and acetaldehyde were the two most important carbonyls for OH reactivity, and the decreasing in their primary emissions was faster than the decreasing of secondary production. The slower dropping of their secondary production was due to the increase of emission of some precursors and the increasing in degree of photochemical aging. The increase in ambient acetone was mainly caused by increase of its primary emissions.

P2.36 - TOTAL OZONE TRENDS IN THE TROPICS 1974 - 2013

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Abstract. Measurements with Dobsonspectrophotometers are used to study ozone trends at Cachoeira Paulista (22.7oS,45.0oW) and Natal (5.8oS,35.2oW) in Brazil. At Natal measurements with ozonesondes data areused. The time series are from 1974 to 2013 for Cachoeira Paulista andfrom 1978 to 1997 at Natal. Using a model that accounts for the quasi-biennialoscillation, seasonal variation, and solar cycle, a trend in total ozone of–2.0±1.2% per decade was found at Cachoeira Paulista for the period 1974 to1997. At Natal the trend was –0.8±0.8% perdecade over the period 1978 to 1997 and 2006 to 2010. The annual values ofcolumn ozone reported at Cachoeira Paulista are lower in the 1990´s than in theprevious two decades: total ozone amounts are 12.5 Dobson units (DU), or 4.6%,lower in the 1990s than those observed during the 1970s. From a monthlyanalysis it is shown that these ozone decreases have occurred in all months ofthe year. There was no statistically significant change between the 1980s and1990s at Natal. The annual values ofcolumn ozone reported at Cachoeira Paulista and Natal are normal in the períod2010 to 2013.

P2.37 - IMPACT OF ASSIMILATING PARASOL FINE MODE AEROSOL OPTICAL DEPTH OVER LAND ON TOP-DOWN ESTIMATES OF AEROSOL EMISSIONS

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We havedeveloped an inversion system that estimates, at the global scale, the monthlyemissions of the main aerosol species, namely sulphur dioxide (SO2),black carbon (BC), particulate organic matter (POM), desert dust (DD) and seasalt (SS). These emissions are estimated for each species over a set ofpredefined regions by assimilating aerosol optical depth into a global aerosol model of intermediatecomplexity. These fluxes representthe best compromise between the assimilated observations and the available apriori information on the emissions. Up until now, the system has been applied with dailytotal and fine mode aerosol optical depths (AOD) from the Moderate ResolutionI-

maging Spectroradiometer (MODIS). However, this dataset does not provide finemode AOD over continent where most of the aerosol species are emitted. Previousstudies with the system have shown the potential for further improvement by including finemode AOD observations over continents. The inversion system has been expandedto include the fine mode AOD over continent from the POLDER (POLarization andDirectionality of the Earth's Reflectances) instrument on board the PARASOL(Polarization & Anisotropy of Reflectances for Atmospheric Sciences coupledwith Observations from a Lidar) mission in addition to the MODIS AOD. Theinversion system has been applied to the year 2010. We will present the impactof the additional observations on one hand by assessing the performance of theinversion computing a set of standard statistics with respect to theassimilated AOD observations and an independent dataset. On the other hand wewill compare the estimated emissions to the previous top-down estimates basedsolely on MODIS data and to traditional bottom-up inventories.

P2.38 - PRELIMINARY RESULTS OF TOTAL OH REACTIVITY IN A MEDITERRANEAN OAK FOREST DURING LATE SPRING 2014

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The hydroxyl radical (OH) is the main oxidizing agent in the atmosphere, therefore it controls the lifetime of many atmospheric trace species. Total OH reactivity measurements help to constrain the actual OH budget, and to determine to what extent unmeasured or unknown reactive species are present in a specific environment.

During May-June 2014, we will perform measurements of total OH reactivity in a Mediterranean Oak forest deploying a Comparative Reactivity Method (CRM) instrument previously assembled in our laboratory and successfully adopted during the ChArMEx experiment in summer 2013.

The field campaign is part of the CANOPEE project, which focuses on biosphere-atmosphere interactions, and takes place at the Observatoire Haute-Provence located in the south of France. The site is characterized by a sparse canopy (average trees height 6m) which extends over a surface of 955 m2 mainly composed of oaks (Quercus pubescens) and to a lesser extent maples (Acer monspessulanum). In addition, the site is in the Mediterranean area, therefore it is exposed to dry and hot summers, with temperature peaking up to 35-40°C.

We will perform total OH reactivity measurements at two different heights: within the canopy (2 m) and above the canopy (10 m); and also at the branch level.

Based on the recent findings on VOC's flux measurements of Kalogridis et al. (2014), we expect to measure total OH reactivity of ~10 s-1 above the canopy and of ~40 s-1 within it. Branch enclosure OH reactivity can peak a few thousands s-1 depending on the experimental conditions that will be adopted. In order to determine the unknown fraction of reactivity, complementary measurements of reactive trace gases as VOC's and OVOC's will be performed with various techniques including ProtonTransfer Reaction-Mass Spectrometry, Gas Chromatography and Liquid Fluorescence.

Our preliminary results of OH reactivity will help to understand the oxidative processes occurring within the canopy, and particularly the low oxidation rates of isoprene suggested by Kalogridis and coworkers.

Reference:Kalogridis, C. et al.,: Concentrations and fluxes of isoprene and oxygenated VOCs at a French Mediterranean oak forest, Atmos. Chem. Phys. Discuss., 14, 871-917, doi:10.5194/acpd-14-871-2014, 2014.

P2.39 - DETERMINATION OF AREAS SOURCE OF ORIGIN OF THE AIR MASSES THAT AFFECT TO CUBAN WESTERN. THE NOX STUDY.

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In this research we used the Hybrid SingleParticle Lagrangian Integrated Trajectory (HYSPLIT) model whichallows you to build the backwardstrajectories of air massesand determine the areas sources of pollutants affecting the Cuban western, in specific to the regional station La Palma in Pinar del Rio province. This research took as yearstudy period from 2006 to 2008. As a result ofthis analysis it was found six areas source. These which were characterizedaccording to their geographical location and potential contaminant sources. Thefirst area source this located to the east of the station and almost travellingthe whole territory Cuban and great part of the Ocean Atlantic. This has beenchosen as the first area to be the one that presents bigger values as for theretrotrayectorias frequency that they arrive to the same one conditionedfundamentally by the zonal flow of winds that is imposed in our country duringalmost the whole year, the Trade Winds. Thenanalyzed the measurement data of nitrogen oxides recorded at the La Palma stationfor identical period of three years. The respectivebackwards trajectories were calculatedfor the level of 500 meterswith duration of 5 days and an interval of 24 hours. This allowed determining the frequency of arrival of pollutants to the west of Cuba bythe abovementioned areas source. Theaverage values ??of pollutants were performed statistical analysis usingANOVA technique tolearn if they are real differencesthat may have these values.

Keywords: HYSPLIT model, backwards trajectories,atmospheric pollutants, areas sources.

P2.40 - ATMOSPHERIC INPUT AND SOLUBILITY OF TRACE METALS OVER THE EASTERN MEDITERRANEAN

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Atmospheric deposition is recognized, as an important source of nutrients, for the oceans. Recent works have highlighted that atmospheric inputs of nutrients and trace metals can considerably influence the marine ecosystem functioning at semi-enclosed or enclosed water bodies such as the eastern Mediterranean.

The current work aims to determine the sources and the factors controlling the variability of nutrients and trace metals in the eastern Mediterranean. Special focus was given on trace metals solubility considered either as key elements for phytoplankton growth such as iron, phosphorus or inhibitors such as copper. This has been accomplished by analyzing size segregated aerosol samples PM10 and PM1 collected for an entire year, at Finokalia, a background site in Crete, Greece.

Aerosol species concentrations indicate an important day-to-day variability closely related to the influence of meteorological conditions and air masses origin. Sahara dust, the largest natural source of aerosols in the area was found to be an important factor controlling the levels of trace metals. For the majority of trace metals examined, their solubility was found to be closely related to pH and dust mass amount. More specifically solubility appears to be inversely related to the crustal elements levels, while it increases in acidic environment. The significance of our findings for the eastern Mediterranean Sea are presented and thoroughly discussed.

This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program “Education and Lifelong Learning” of the National Strategic Reference Framework (NSRF) - Research Funding Program: ARISTEIA – PANOPLY (Pollution Alters Natural Aerosol Composition: implications for Ocean Productivity, cLimate and air qualitY) grant.

P2.41 - EVALUATION OF REGIONAL ISOPRENE EMISSION ESTIMATES IN CALIFORNIA BASED ON DIRECT AIRBORNE FLUX MEASUREMENTS

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Vegetation in California comprises a largesource of isoprene, terpenes, and other biogenic volatile organic compounds(BVOC) which react in the presence of NOx and sunlight leading toproduction of ozone and particulate matter. We flew an airborne PTRMS eddy covarianceflux measurement system over regions of California expected to have substantialisoprene emissions and used temporally and spatially resolved wavelet fluxes totest a regional BVOC emission model.

We observed highconcentrations (up to 8 ppbv) and high surface emissions of isoprene rangingfrom several to more than ten mg m-2 h-1 from the oakwoodlands in the foothills of the Sierra Nevada and Coastal Ranges. Consistentwith other studies we show that in the Central Valley isoprene emissions aretypically small or undetectable except for the areas of Eucalyptus treesplanted near the highways.

Basal EmissionFactors (BEFs) derived from airborne fluxes at 2km resolution were used toassess isoprene emission-factor databases for BVOC emission models. BEFs fromthe landcover used by MEGAN 2.1 agreed within 10% ($r2=0.8$) withmeasured BEFs, with few discrepancies (either overestimation orunderestimation). Independently, the area emissions modeled for the same flighttimes and averaged for the same flux footprints were compared with measuredarea emissions with similarly good agreement. We show that the landcover hasthe most critical influence on model-measurement agreement and to a lesserextent the meteorology and LAI.

These highlyresolved airborne eddy covariance fluxes based on wavelet analysis are shown tohave an extremely high potential for improving modeling even at a coarse time-resolution as typically used in the regional and global models. A new application could be the exploration ofshort-term (1 min) variability in fluxes driven by fluctuating temperature andPAR variables to which emission responses are non-linear. Asymmetricalflux-footprint representations, reduced model time-steps, and a high timeresolution of input variables are further tested on selected segments to understandthe importance of short-term variability in emissions and effects on ozone atthe finest spatiotemporal scales.

P2.42 - SEASONAL AND INTERANNUAL EVOLUTION OF THE MONOACIDS ORGANICS IN THE ATMOSPHERE OF THE HUMID SAVANNA OF LAMTO (CÔTE D'IVOIRE)

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This work was made within the framework of the network IDAF (IGAC/DEBITS/Africa). It concerns the follow-up of the acidity of the atmosphere of an ecosystem of wet savanna from the organic fraction of the free acidity. It is a question of understanding the major factors which cause the variability of this organic acidity in the interannual and seasonal scales. During ten-year period (1995- 2004) 860 rainy samples were collected in the wet savanna of Lamto. By using Henry's law, we determined the contents in the air of major organic monoacids (HCOOH and CH3COOH) from the concentrations of these acids measured in rains. The annual partial pressure of organic monoacids on the decade is extremely variable. It is 0,675 ± 0,56 ppb and of 0,413 ± 0,14 ppb respectively for the formic acid and for the acetic acid. This strong variability is bound to their various sources which are also very variable from one year to the next. The organic acidity varies from 40 % to 60 % on average and almost stable rest from a season to the other one. The seasonal analysis shows that generally the partial pressures of organic acids are of a factor twice as raised in dry season that in wet season. This difference is not inevitably connected to the quantity of haste registered from a season to the other one. But would more be connected to the biomass burning which contribute from 21 % to 51 % to the formation of organic acids in the wet savanna of Lamto.

P2.43 - GLOBAL MONITORING OF HCOOH AND CH3OH BY IASI

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Methanol (CH3OH)and formic acid (HCOOH) are among the most abundant volatile organic compounds presentin the atmosphere. Their sources are different. CH3OH is mainlyemitted by biogenic processes such as plant growth and plant decay, and to alesser extent, by biomass burning, oxidation of methane and other volatileorganic compounds (VOCs), as well as anthropogenic emissions from car trafficand industrial activities. HCOOH has small direct emissions by vegetation, biomassburning, soils and motor vehicles but it is mainly a secondary product from otherorganic precursors.

Methanol and formicacid are both important for the oxidizing capacity of the troposphere and theglobal budget of tropospheric ozone (O3). Formic acid is also asubstantial source of cloud and rain acidity in remote areas. There are howeverstill large uncertainties in their sources and sinks despite recent progressmade possible by the synergetic use of atmospheric models and satellite data.

In this work, we derivethe global distributions of these two organic species between 2008 and 2012 usingspectra from IASI (Infrared Atmospheric Sounding Interferometer) launchedonboard the MetOp-A satellite in 2006. IASI is a nadir looking Fourier transformspectrometer sounding the atmosphere with a global coverage twice per day.

We present globaldistributions of both compounds in comparison with simulations from the IMAGES model from 2008to 2012. The instrument allows us to obtain 5-year time series of the column abundancesfor different regions, highlighting the impact of interannual variability in forestfires and vegetation emissions on their concentrations.

P2.44 - BRIDGING THE GAP BETWEEN MODELED AND OBSERVED ELEMENTAL COMPOSITION OF ORGANIC AEROSOL

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Organic aerosol is a major component of fine particles in the troposphere. However, global chemical transport models have been, unable to capture the magnitude and variability of the mass concentrations of organic aerosol. Uncertainty remains in model schemes, including the identification of primary sources and secondary tracers, the understanding of the formation mechanisms, and the representation of the atmospheric evolution of organic aerosol etc. Bulk oxygen-to-carbon (O:C) ratios of organic aerosol have been simulated in models to constrain the sources and atmospheric evolution of organic aerosol. However, there have been limited ambient measurements available to test such simulations. In this study, we synthesize large-scale surface and aircraft observations of the O:C and hydrogen-to-carbon (H:C) ratios of organic aerosol and develop a global model simulation for these ratios based on recent laboratory observations. Model simulations are evaluated against the observations to investigate the role of sources and atmospheric evolution of organic aerosol. The comparisons reveal an important gap between the modeled and observed elemental composition of organic aerosol, which cannot be explained by the underrepresented secondary organic aerosol produced by the oxidation of intermediate-volatility organic compounds (IVOC). Model performance is substantially improved when a simplified oxidative-aging scheme is implemented,highlighting the importance of aging on modifying the chemical composition of organic aerosol. We also show that treating the primary organic aerosol sources as semi-volatile organic compounds (SVOC) and increasing their emissions can further improve model-observation agreement in urban areas. Our work also suggests that heterogeneous aging of secondary organic aerosol is necessary for reproducing the vertical profile of O:C.

P2.45 - REGIONAL MODELING OF THE LAND/OCEAN-ATMOSPHERE INTERACTION USING WRF-CHEM: IMPLEMENTATION OF HIGH RESOLUTION SURFACE EMISSIONS

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The regional modeling of the atmospheric chemistry is nowadays an important tool for the geoscientific community. Its applications expands over a broad field of studies, ranging from addressing the dispersion of pollutants plumes in the surroundings of urban

centers to studying the physicochemical basis of the interaction between chemical species and the production of natural and anthropogenic aerosols. WRF-Chem is a powerful computational tool developed to perform these types of studies, with a strong focus on the climatic feedbacks resulting from the coupling of the meteorology and the chemistry. WRF-Chem efficiency relies on a proper configuration of the specific region to study, the correct selection of the physical and chemical parameterizations for each case, and the implementation of consistent boundary conditions and input databases. As an operative tool, only a few modeling studies using WRF-Chem have been performed in the South American continent, mainly due to the lacking of comprehensive and cooperative geophysical databases with high temporal and geographical resolution.

Here we present the guidelines to build highly resolved biogenic and anthropogenic surface emissions databases suitable for local and regional scale simulations withWRF-Chem for different applications. The article presents, a bottom-up methodology to prepare a high-resolution mobile emissions inventory for the city of Mendoza (Argentina), which has been used for regional air quality modeling studies in a topographically complex region. In addition, we have adapted a satellite based oceanic emissions inventory of biogenic very-short lived (VSLs) halocarbons with an increased coast-to-ocean ratio, oriented to the study of the halogen impact on the oxidation capacity of the marine troposphere and ozone depletion.

The methodologies used for the implementation of the current emissions into WRF-Chem are described, and the geographical distributions of the surface fluxes are given. Also, a comprehensive analysis of the most important concepts and module parameterizations to consider when studying the surface-atmosphere interaction is given.

P2.46 - TRUE EMISSION FACTORS FOR FOREST FIRES AND THE ROLE OF NON-FIRE NOX

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The standard way to estimate biomass burning emissions factors from airborne, surface, or laboratory data is to relate the emitted pollutant concentration tothe carbon burned, Ctot, and liberated to the air ,mostly CO2. We approximate total emitted carbon Ctot ~ (CO2 + CO). Emission ratios that are based on CO, describing burning effects, delta-parameter / delta-CO, are often used to quantify fire emissions. These are not as useful as emission factors, for they often complicate analyses, since delta-CO / delta-CO2 may vary by unto tenfold, and can have bias artefacts of similar magnitude. We present a methodology that estimates both emission factors and a reasonable description of background Ctot.

High O3 values require a history of the balanced interaction of two pollutant types, nitrogen oxides (NOx) and a radical source, VOC's. However, high VOC / NOx ratios seen in many plumes, especially from smoldering-dominated fires, make substantial O3 formation less likely. One particularly intense fire we analyzed, the notorious Rim Fire of 2013, near Yosemite, California. It produced notable quantities of free NOx and (both gas- and particle-phase) Cl species. Consequently, we also outline a quantitative way to assess the effects of anthropogenic or lightning NOx. We provide the example of California burning emissions using measurements of HCHO, NO, and the photolysis rate jHCHO.

P2.47 - EVIDENCE OF BIOMASS BURNING AEROSOLS TRANSPORTED FROM THE AMAZON TO THE CENTRAL ANDES (BOLIVIA)

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Biomass burning has become a major yearly event in Bolivia as far as the 1980's. During biomass burning season, typically between August and October, large amounts of fires occur in the lowlands and adjacent countries like Brazil, Argentina and Paraguay. As a result, smoke, product of these fires, is transported large distances over the continent. The possible transport of aerosols originating from biomass burning in the lowlands (Amazon region) was studied using a MOUDI impactor to collect atmospheric particles differentiated by size. The fine fraction of particles was collected on impactor stages 4,5,6,7,8 (corresponding approximately to 0.13, 0.26, 0.50, 0.94, y 1.7 mm in aerodynamic diameter adjusted to 0.55 atm). Samples were taken at sites in the Amazon and at the Chacaltaya Mountain research station during seasons of relative influence and non-influence of plumes from biomass burning. During the influence season, a marker of biomass burning such as K was identified in particles sampled at the Chacaltaya station. Back trajectory models initial results indicate air mass transport from the Amazon to the Chacaltaya station sampling site in the biomass burning season. There is some evidence of aerosol transport from biomass burning and that they are an important factor influencing local atmospheric radiative effects which might affect glacier retreat in the tropical Andes.

P2.48 - COMPARISON OF METHANE CONCENTRATIONS OBSERVED FROM SPACE WITH MODEL SIMULATION OVER MONSOON ASIA

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Hayashida et al. (2013) reported the geographical distribution of high xCH4 values observed from scanning imagingabsorption spectrometer for atmospheric chartography (SCIAMACHY) corresponds to the regions where rice is cultivated, as indicated in the inventory maps. Inthis study, we also examine the CH4 concentration observed by Greenhousegases Observing SATellite (GOSAT) over Monsoon Asia. GOSAT was launched inJanuary 2009 to monitor the global distributions of CO2 and CH4from space, and since then GOSAT has been continuing measurements until 2014. The spatiotemporal variation of xCH4 observed by GOSAT is almost consistent with that obtained by SCIAMACHY. We report the spatial distribution andseasonal variation of methane observed by GOSAT since 2009 and we compare the results with model simulations using NICAM -TM to investigate CH4sources and transportation processes.

References

Hayashida et al. (2013), RemoteSensing of Environment 139, 246–256.

P2.49 - CHEMICAL CHARACTERIZATION OF SUBMICRON AEROSOL PARTICLES WITH AEROSOL MASS SPECTROMETERS, LABORATORY AND FIELD STUDIES

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Fine particles affect the climate in complex ways that are not fully understood and were verified to be harmful to animal and human health. For these reasons information concerning their composition is important to understand their behavior and to elaborate strategies to mitigate air pollution in urban environments.

In this study the chemical composition and source of the particulate matter (PM1) were investigated in more detail through field experiments. The field experiments were performed at three different sites: rural (San Pietro Capofiume, Italy), urban (Santiago de Chile, Chile), and background urban (Helsinki, Finland) with the HR-ToF-AMS and ACSM, instruments that measured only the non-refractory PM1 (NR-PM1). For this reason the new SP-AMS was further characterized in order to evaluate its feasibility to detect trace metals.

The use of the positive matrix factorization (PMF) has shown useful in the identification of PM sources. Thus, the PMF was applied to the mass spectrometers datasets and 11 different components of the organic aerosol (OA) were identified, 6 types of oxygenated OAs (OOAs), one containing substantial organosulfate fragments from methanesulfonic acid (MSA),long-range transported biomass burning OA (LRT-BBOA), nitrogen-containing OA(NOA), local BBOA, coffee roastery OA (CROA), and hydrocarbon-like OA (HOA). The last three most likely represented the primary organic aerosol (POA), while the others represented the secondary OA (SOA). The OM was dominated by aerosol particles of secondary origin (65%).

In addition, the size-resolved chemical composition was investigated in detail for different episodes in Helsinki and revealed internally and externally mixed aerosol particles in two different modes, an accumulation (~470 nm) and a lower mode (~130nm). The different modes were composed of different compounds and suggested a rather acidic lower mode mainly dominated by nitrate most likely from local traffic emissions.

Finally, the laboratory experiments accomplished with the SP-AMS successfully confirmed the feasibility of detection of trace metals in real time. 13 different metals were identified through the determination of isotopic patterns. The measurement of trace metals by the SP-AMS represents a step forward in the study of sources and might be extremely useful in the next source apportionment studies.

P2.50 - THE ROLE OF LAND COVER CLASSIFICATION ON WEATHER FORECASTING MODELS COUPLED WITH CHEMISTRY: A WRF-CHEM 3.2 BASED STUDY FOR THE AMAZONIAN AREA OF MANAUS, BRAZIL

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Landcover classification is one of the main components of the modern weatherresearch and forecasting models, mainly if the simulations are performed byusing coupled Chemistry. Spatial distribution of different database of land usewill influence the chemistry of the model, since the classifications ofdifferent land use files don't agree on a regional basis. In this study theimpact of using two traditional land use classifications, Moderate-resolutionImaging Spectroradiometer (MODIS) and The United States Geological Survey(USGS), were evaluated. The Weather Research and Forecasting (WRF) model coupledwith Chemistry (WRF-Chem) and considering an inventory of anthropogenic andbiogenic emissions was used. Meteorological fields, such as temperature andrelative humidity, and chemical compounds, such as isoprene, NOx, O3,PM2,5 and PM10, were evaluated for the two land usefiles. The WRF-Chem model was run during the period 1-3 August, 2012, at a gridspacing of 3km and centered on the Manaus. The results of simulations indicateda good representation of meteorological fields, with slight advantage forMODIS. In terms of pollutants, the USGS showed slightly higher values, about5-10% for the concentration of PM2,5, PM10 and O3,depending on time of the day. NOx showed greatest differences,varying between from 20 to 100%. On the other hand, the isoprene concentrationwere observed being about 2-8% lower for USGS. Although the mean concentrationof PM2,5, PM10 and NOx predominates for USGS,it was observed that in terms of maximum values there is a clear diurnal cycle,with MODIS predominating in the nocturnal part of the cycle. The results ofthis study suggest that the differences in spatial distribution of land coverclasses could explain the discrepancies between the database. To date the USGSclassification doesn't recognize the urban class for Manaus city, whereas it isvery well represented by MODIS. In terms of water bodies, there are significantdifferences between the two files, highlighting the fact that BalbinaReservoir, with about 2360 km2, is not represented by the USGS.Finally, it is important to recognize that the differences in local values canbe much more expressive than the mean values.

P2.51 - STABLE CARBON ISOTOPE AND AMS STUDIES FOR TRANSBOUNDARY SOA IN WESTERN JAPAN

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Filter samples of total suspended particulate matter, collected every 24 h in the winter of 2010 at an urban site and two rural sites in western ,were analyzed for concentration and stable carbon isotope ratio (d13C)of low-volatile water-soluble organic carbon (LV-WSOC). Concentrations of major chemical species in fine aerosol (<1.0 mm) were also measured in real time by aerosol mass spectrometers. The oxidation state of organic

aerosol was evaluated using f44, the proportion of the signal at m/z 44 (CO2+ ions from carboxyl group) to the sum of all m/z signals in the organic mass spectra. A high correlation between LV-WSOC andm/z 44 concentrations suggests that LV-WSOC here is likely associated with carboxylic acids in fine aerosol. Plots of d13C of LV-WSOC versus f44 exhibit random variation at the urban site and systematic trends at the rural sites. The systematic trends qualitatively agree with a simple binary mixture model of secondary organic aerosol with background LV-WSOC with f44 of ~0.06 and d13C of -17‰ or higher. Comparisonwith reference values suggests that the source of background LV-WSOC is possibly primary emissions associated with C4 plants.

P2.52 - DEVELOPMENT AND EVALUATION OF A VEHICULAR EMISSIONS INVENTORY BASED IN TRAFFIC COUNTS FOR METROPOLITAN REGION OF SÃO PAULO

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Thisstudy aims to develop and evaluate a new emissions inventory withvehicular flow road-per-roadpor Metropolitan Region of São Paulo andits evaluation and atmospheric simulation with WRF-Chem. The methodconsisted in a generalized linear model of vehicle counts asdependent variable and type of road and hour as independentvariables. Poisson and negative binomial distributions wereconsidered for vehicucle counts distributions. The results show thatmerely the type of road gives significant estimates for every type ofvehicule for each hour. Further evaluation should be addressed inorder to incorporate other variables to the model, like congestion.

Introduction: The relationship between emissions inventories, meteorology andair quality has been widely studied (Andrade et al,2012). In order to obtain model of traffic counts, Zhong etal (2004) used an ARIMA . Zhao et al, (2004) used a regression modelto estimate annual average daily traffic. Considering this we developa traffic model relating type of road with Poisson distribution forvehicle counts (Zeileis et al, 2008). Later we used information of ofNational Department of Transit and Local Environmental Agency toobtain vehicular technology; and daily profile of traffic flowprovided by Maplink. For evaluationd WRF-Chem simulations wereperformed. Methodology: It was used generalized linear modelswith Poisson distribution for the traffic count with independentvariables of type of road and hour of the day: log (veh)=ß 0 +ß1 *TR+e: veh is traffic count, TR type of road (primary,secondary, tertiary, trunk and motorway). The traffic counts wereprovided Companhia de Engenharia de Tráfego for morning and eveningpeaks and contains cars, urban buses, trucks, motorcycles. Type ofroad was identified by Open Street Data. There are 206 traffic countsin São Paulo for the following hours: 08:00-09:00. Results:The frota estimated was emissions estimated were 6.482.518 (veh)emitting 1.468.959 (t CO/y), 558.889 (t NOx/y) and 328.884 (t COV/y),Conclusions The type of road is able for predicting the numberof vehícules. Nevertheless, the model would improve with congestion,land use and lanes per road. The east side of São Paulo downtown hashigher emissions.

P2.53 - A PRELIMINARY ASSESSMENT OF PARTICULATE AIR POLLUTION IN JEDDAH, SAUDI ARABIA

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Urban air pollution is rapidly becoming a major environmental concern worldwide, as it influences public health as well as local and regional weather/climate. Air pollution in Saudi Arabia is particularly an issue. Our study aimed to assess particulate air pollution in Jeddah city, Saudi Arabia and the associated morbidity due to cardiovascular and respiratory diseases. The 24-h levels of ambient fine particulate matter (PM2.5) were collected at a fixed site. We measured black carbon (BC) from PM2.5 filters using a dual -wavelength optical transmissometer; and trace metal elements using X-Ray Fluorescence spectrometry (XRF). Additional analyses for Ions and Cations (NO3– and SO42+) using ion chromatography (IC) are included as part of future research activities. The daily PM2.5 and BC levels showed significant temporal variability ranging from 23 – 186 µg/m3 and 0.70 – 3.09 µg/m3, with respective average concentrations of 74.20 µg/m3and 1.53 µg/m3. These PM2.5 levels exceeded the 24-h WHO guideline (20 µg/m3). Trace metals found to be in significantly higher concentrations included S, Si, Ca, Fe, Al, Cl, Na, Mg, K, and Pb, with average concentrations of 3.56, 2.40, 1.26, 0.96, 0.86, 0.70, 0.69, 0.35, 0.34 and 0.27 µg/m3 respectively. Additionally, an Air Quality Index (AQI) was calculated for PM2.5 at Jeddah, with any PM2.5level beyond moderate, reported as a "level of health concern" (good: =12 µg/m3, moderate: 12.1–35.4 µg/m3, unhealthy for sensitive groups: 35.5 – 55.4 µg/m3, unhealthy: 55.5 – 150.4 µg/m3, very unhealthy: 150.5 – 250.4 µg/m3, and hazardous: 250.5 – 350.4 µg/m3). Based on this AQI, there were 8% days of moderate air quality, 28% days of unhealthy air quality for sensitive groups, 55% days of unhealthy air quality and 9% days of very unhealthy air quality throughout the study period. Our results suggest a significant contribution of industrial and auto-mobile sources to the overall PM2.5 emissions in Jeddah. In addition to monitoring mass concentrations, our study highlights the need for studying the chemical components of PM2.5 so as, to most effectively protect human health and the environment.

Key Words: Fine Particulate Matter (PM2.5), Black Carbon (BC), Air Quality Index (AQI), Particulate Air Pollution.

P2.54 - TRACE GASES SOIL EMISSIONS AND GLOBAL WARMING POTENTIALS FROM VENEZUELAN CORN FIELDS UNDER TILLAGE AND NO-TILLAGE AGRICULTURE

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Developing-worldtropical agriculture is expanding rapidly; but little is known about its impacton atmospheric trace gas emissions, including both greenhouse gases (GHG) andsmog forming pollutants. This is crucial in Latin America and the Caribbean(LAC) because agriculture represents a key factor in regional food security andthe extension of arable land has increased in the past 50 years from 7 to 11 %of the global arable land

area. Also, in spite of LAC covering only 15% of theglobal arable land, its relative contribution to the global N2Oemissions is about 10%. We evaluated the effect of agricultural management: till(T) and no-tillage (NT), on trace gases emissions (N2O, NO and CO2) from Venezuelan corn fields at two of the largest cereal producer regions:Guárico and Portuguesa. Our results show that average emissions of NO and CO2were larger in T in comparison to NT sites, while N2O fluxes theopposite. We calculated the global warming potential (GWP) of these corn fieldsbased on soil greenhouse gases fluxes and CO2 emitted during theproduction of applied N-fertilizer. We found that the major contribution of GWPfrom these soils was related to N-fertilizer CO2 emissions duringproduction. We also found, lower GWP for NT sites than for T sites by 17 %. Wesuggest that agriculture mitigation actions for tropical monocrop systemsshould aim the reduction of N fertilization application and enhancement of NTagricultural practice. In spite of NT larger N2O emissions incomparison to T, the higher GWP found in T management are related to its largerCO2 emissions. Therefore, NT practices are more effective mitigationto climate change from these monocrop systems. In Venezuela 70% of agriculturalmanagement is NT, which implies that by using this practice alone in such highproportion, this country have a GWP reduction of 17 % than if only T practicewere used.

P2.55 - REACTIVE AND NON-REACTIVE TRACE GAS PROFILES WITHIN AND ABOVE AN AMAZONIAN RAINFOREST

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Theremote Amazonian rainforest is one of the last regions on earth with minimalanthropogenic influence. It is therefore ideal for studying trace gas exchangein a natural environment in absence of nearby emission sources. In 2011 a 80 mhigh walk up tower for atmospheric research was erected at the remote ATTO(Amazon Tall Tower Observatory) site (02°08’38.8’’S, 58°59’59.5’’W). SinceApril 2012 mixing ratio gradients of H2O, CO2 and O3from 8 different heights between 0.05 m and 79.3 m were measured. During threecampaigns (Oct.-Dec. 2012, Oct-Nov 2013, Mar 2014) NO and NO2 wereadditionally measured. From a preliminary analysis, NO peaks above canopy inthe morning could be related to export of below-canopy air that was enriched inNOx and CO2 and depleted in O3.

Furthermore,simultaneous measurements of VOCs, NOx, O3 and severalaerosol properties were made in March 2014. These data will be used to identifydifferent regimes of O3 destruction and formation within and abovethe canopy. Comparisons with data from the end of Sept. 2013 are used toinvestigate the differences in trace gas mixing ratios (air chemistry) andtheir relation to vertical transport between the dry and the wet season inCentral Amazonia. In combination with the above mentioned quantities backtrajectories will be used to identify the influence of biomass burning on theformation of ozone at the ATTO site.

P2.56 - MASS SPECTRAL OBSERVATIONS OF SUBMICRON AEROSOL PARTICLES AND PRODUCTION OF SECONDARY ORGANIC AEROSOL AT AN ANTHROPOGENICALLY INFLUENCED SITE DURING THE WET SEASON OF GOAMAZON2014

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As part of GoAmazon2014, a high-resolution time-of-flight aerosol mass spectrometer (HR-ToF-AMS) was deployed to characterize the composition, size, and spectral markers present in submicron atmospheric aerosol particles at a site downwind of Manaus, Brazil, in the central Amazon basin. The focus was on the influence of biogenic-anthropogenic interactions on the measured aerosol particles, especially as related to the formation of secondary organic aerosol (SOA). Through a combination of meteorology, emissions, and chemistry, the research site was affected by biogenic emissions from the tropical rainforest that were periodically mixed with urban outflow from the Manaus metropolitan area. Preliminary results from 1 February to 31 March 2014 show that for the wet season, the PM1 mass concentration varied from 0.4 to 3.0 μg/m3 (5 to 95 percentile of distribution). The composition was dominated by organic species (80%), and sulfate (13%), followed by ammonium (4%), and nitrate (2%), most of which is estimated to be organic nitrates. The mass-diameter distribution of the particle population had a dominant mode between 300 and 400nm (vacuum aerodynamic diameter, dva). At times, a smaller mode at dva between 100 and 150 nm was also present. Highly oxidized organic material was frequently observed, characterized by a dominant peak at m/z 44 that was on average 18% of the total organic mass spectrum. There was a diel trend in the elemental oxygen-to-carbon (O:C) ratio, starting from a typical value of 0.6 in the morning, peaking at 0.7 in the afternoon, and returning to 0.6 at night.

The analysis of the results aims at delineating the anthropogenic impact on the measurements. Multivariate statistical analysis by positive-matrix factorization (PMF) is applied to the time series of high-resolution organic particle mass spectra. The factors and their loadings provide information on the relative and time-varying contributions of different sources and processes affecting the organic component of the aerosol particle phase. Relationships between AMS results and measurements from co-located instruments that provide information on anthropogenic and biogenic gas and particle tracers are investigated, toward the goal of improving the understanding of anthropogenic influences on the submicron atmospheric particle population.

P2.57 - EMISSIONS FACTORS OF GASEOUS POLLUTANTS FROM FLEXIBLE-FUEL LIGHT-DUTY VEHICLES

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This studyinvestigated the impact of vehicular fuels on the emission of unregulated (hydrocarbonsand aldehydes) and criteria air pollutants (THC – total hydrocarbons, NMHC – non-methanehydrocarbons, CO – carbon monoxide, NOx – nitrogen oxides), greenhouse gas (CO2)from a fleet of Flexible Fuel light-duty vehicles. Emission measurements wereperformed in triplicate over the ABNT NBR 6601:2005 driving cycle using achassis dynamometer for three different fuels in each of three vehicles. Thetest fuels included a gasoline blend S-800 (800 ppm Sulfur content) and S-50 (50ppm Sulfur content) with a 22% ethanol anhydrous content (namely gasohol), and hydratedethanol fuels (5.7 % water content). The hydrocarbon analysis wasperformed with a GC-FID system (Perkin Elmer). Gasohol S-800 showed the highest emission factors for almost all studied hydrocarbons, especially benzene, 3-methyl-pentane,trans-2-hexene,cyclopentane, isopentane and methylcyclopentane inphase 1 of driving cycle. Gasohol S-50, in descendingorder of the hydrocarbons emission factors,include trans-2-hexene, methylcyclopentane, benzene, cyclopentane, n-undecane and cis-2-pentene. The sum of the characterized hydrocarbonsemissions were lower for ethanol biofuelfor the three vehicles tested, with higher emissionsfactors for m,-p-xylene,and other aromatics such as 1,2,4-trimethylbenzene, o-xylene and m-ethyltoluene.On the other hand, ethanol biofuel showedthe highest emission factors for CO, NOx, THC, NMHC, CH4 and aldehyde gases. Withthe use of ethanol biofuel there was a trend of increasing acetaldehydeemissions, while for gasohol no significant difference was observed between gasohol S-800 and S-50 in aldehydesemissions. CO2 emissions did not show any significant trends,and NOx emissions were lower with the ethanol biofuel for all vehicles.

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P2.58 - HISTORICAL TRENDS IN AEROSOL WATER IN THE SOUTHEASTERN UNITED STATES

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Particle-phase liquid water is a ubiquitous component of atmospheric aerosols and influences a variety of critical atmospheric processes, including light scattering, the hydrological cycle, aqueous chemistry, and particulate matter (PM) formation. Previous studies indicate that there have been major improvements in air quality in the southeast United States over the past decade due to reductions in anthropogenic emissions such as sulfur dioxide and oxides of nitrogen. Yet despite the abundance and importance of aerosol water, it is not routinely measured, and mass concentrations are not well known. Here we use the thermodynamic model ISORROPIA (v2.1) to estimate aerosol water mass concentrations from 2000-2010 in urban and rural locations using speciated ion and meteorological data from sites that are a part of the Southeastern Aerosol Re-

search and Characterization (SEARCH) network. The purpose of this study is to better understand the historical trends of aerosol water in the southeastern United States in the context of improved air quality. Analysis in the region of the Southern Oxidant and Aerosol Study (SOAS) indicates decreases in aerosol water mass concentrations by 29%, 60%,and 67% over the last decade for June, July, and August, respectively. The observed trends are consistent with the hypothesis that decreases in aerosol water may explain recently noted reductions in organic mass concentrations despite no apparent decrease in biogenic volatile organic carbon precursor emissions. These results provide evidence for modulation of biogenically derived PM in the presence of anthropogenic perturbations.

P2.59 - CORRELATION BETWEEN THE CARBON STOCK PRESENT IN THE SOILS OF THE TIJUCA NATIONAL FOREST AND ON THE CAMPUS OF THE FEDERAL RURAL UNIVERSITY OF RIO DE JANEIRO AND EMISSIONS OF GREENHOUSE GASES.

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Various studies conductedaround the world in recent years have had a great relationship between climatevariables influencing the rates of greenhouse gas emitted from the soil intothe atmosphere. Separate the effects of these factors is critical to understandthe dynamics of the forest ecosystem carbon underground. In Brazil thisbehavior has become increasingly important to the extent that the contributionsof greenhouse gases (GHG) are credited mostly to deforestation and theconsequent change of land use, agricultural activities and agriculture. Theobjective of this work is to estimate data on the stock of carbon in the soil andgreenhouse gases, mainly CO2, CH4 and N2Oemissions through the use of static cameras, controlling the flow and volume ofgases emitted and subsequently stored in Tedlar bags for were identified andquantified in gas chromatography. The areas of study are the National TijucaForest with abundant forest formation and higher level of ecological balancethe campus of the Federal Rural University of Rio de Janeiro with forestfragment in the initial stage of regeneration, used as pasture, combiningpoints of dense vegetation and open fields, and present areas with incidence ofhydromorphic soils.

P2.61 - TRANSPORT OF FIRE PLUMES TOWARD THE ARCTIC USING GLOBAL MODELLING

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Boreal wildfires are recognized as an important seasonal source of pollutants in the Arctic. Fire smoke affects chemical and physical properties of the atmosphere at a widerange of spatial and temporal scales, depending on the lifetime of emitted species and transport pathways. Quantification of fire influence in the Arctic is still uncertain, due to uncertainties in the amount of trace gas and aerosols emitted, their transport, and more specifically their injection height. To better characterize pollution in the Arctic and boreal fire emission influences on atmospheric composition several in situ field campaigns have been conducted in the recent years: ARCTAS and POLARCAT campaigns in 2008; BORTAS in 2010. Furthermore, since a decade of satellite retrievals have provided information about fire characteristics (location, intensity and area burned), as well as fire plume composition (aerosols and trace gases). Here, we investigate the influence of pyro-convection on the vertical and horizontal structure of fire plumes, as well as the chemical composition during long-range transport.

Simulations are performed with the LMDZORINCA_v5 global chemistry transport model. This model includes a pyro-convection scheme that considers the fires intensity through Fire Radiative Power (FRP) and Burned Area (BA) global spaceborne measurements derived from MODIS instrument. We will present an evaluation of the simulations focusing on two periods during 2008 (Mars-April and June-July), which were affected by significant fire emissions, against in situ aircraft and satellite observations (CALIOP and MISR for fire injection height and aerosol plume height and width, IASI CO for long-range transport pathways). An evaluation of the importance of injection height in terms of transport pathways and ozone production is examined.

P2.62 - INTERCOMPARISON OF SECONDARY ORGANIC AEROSOL MODELS BASED ON SECONDARY ORGANIC AEROSOL TO ODD OXYGEN RATIO IN TOKYO

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Improvement of secondary organic aerosol (SOA) models is critical in order to accurately understand behaviors and sources of atmospheric aerosols. Over the last decade, a number of SOA production pathways were newly found, and several new SOA models have been developed. However, comparative studies on performance of multiple SOA models are limited to date. In this study, results of five SOA models, including yield models, a mechanistic model, a near-explicit model, and a volatility basis set (VBS) model, were compared. The model performance of the SOA models were evaluated by comparing with the observed ratio of SOA and odd oxygen ([Ox] = [O3] + [NO2]). It has been shown that, in Tokyo, SOA correlated well with Ox, and thus, Tokyo is an appropriate research field for this model intercomparison. All the five models showed similar results for gaseous species, including ozone, reactive nitrogen, hydroxy radical, and volatile organic species. By contrast, simulated SOA concentration largely varied among five models. VBS model well reproduced the observed SOA/Ox ratio, while other four models largely underestimated this ratio. Sensitivity of SOA/Ox ratio to input parameters, volatility distribution of SOA, and source contributions of SOA were also compared.

P2.63 - MASS CONCENTRATIONS OF ORGANIC AEROSOL AND PM2.5 IN EAST ASIA REPRODUCED BY USING VOLATILITY BASE-SET APPROACH IN THE WRF-CHEM MODEL

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additional co-author: Yutaka Kondo (Department of Earth and Planetary Science, Graduate School of Science, The University ofTokyo, Japan) Reproducing chemical composition of fine aerosolparticles and their individual concentration levels over East Asia in the chemicaltransport models is urgently needed, to improve predictive capability of highconcentration episodes and to establish adequate countermeasures. Using traditionalgas/aerosol schemes, regional chemical transport models always underestimated organicaerosol (OA) mass concentrations by around a factor of 5, as evaluated against ECOCobservations, during our field campaigns performed at Fukue Island in Japan(32.75°N, 128.68°E) in May 2009, Rudong in China (32.26°N, 121.37°E) inMay/June 2010, and Jeju Island in Korea (33.35°N, 126.39°E) in October 2012. Herewe report that the volatility base-set (VBS) approach (Donahue et al., 2006) couldreasonably reproduce the observed levels of OA and its temporal variations inEast Asia in the WRF-Chem model with a horizontal resolution of 60 km. Semi-/intermediatevolatile organic compounds were assumed to react with OH at a rate coefficientof 1 × 10-11 cm3 molec-1 s-1 toproduce surrogate species with effective saturation concentrations lowered byan order of magnitude. The introduction of the VBS approach increased the model/observationratios of OA mass concentrations to 0.64–1.46, when OA/OC ratio was assumed tobe 2. It is implied that OH oxidation is highly efficient in converting organicgases to aerosols in this region. This is consistent with the facts that anAerodyne Aerosol Mass Spectrometer has recorded the organic mass fraction ofm/z 44 (f44) as high as 0.20, and that a constrained RACM2 box model simulationpredicted high daytime maximum and 24-hour average OH concentrations (7.3 and2.2 × 106 radicals cm-3, respectively) at Fukue in May2009. Also, the WRF-Chem model successfully reproduced concentration levels andvariations of water-soluble species (sulfate etc) and black carbon, suggesting superiorperformance in simulating PM2.5 mass concentrations as their sum values.

P2.64 - ISOPRENE OXIDATION PRODUCTS MEASURED BY SV-TAG REVEAL DIFFERENCES IN CHEMISTRY AND PARTITIONING BETWEEN NATURAL AND POLLUTED ENVIRONMENTS

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Anthropogenic pollutants affect biogenic secondary organic aerosol formation through changing chemistry and reaction conditions, but the impacts and details of this interaction are still poorly understood. Though extensive laboratory studies have characterized the oxidation chemistry of isoprene and monoterpenes undermost atmospherically relevant conditions, few time-resolved observational measurements of organic tracers are available to constrain the relative importance of chemical pathways. We present ambient hourly measurements of oxidation products of biogenic emissions in two locations: the Southeastern U.S. (SOAS 2013) and Amazonia, Brazil (GoAmazon 2014). In both of these measurement locations, high levels of biogenic emissions interact with occasional plumes from nearby cities, creating an ideal environment to study anthropogenic-biogenic interactions in aerosol formation. A Semi-Volatile Thermal desorption Aerosol Gas chromatograph (SV-TAG) was modified to include simultaneous collection of particle-phase and total gas- and particle-phase compounds, as well as derivatization of hydroxyl groups prior to GC analysis to enable measurement of oxygenates. Using SV-TAG, concentrations and gas-particle partitioning of a wide range of tracers were measured, providing ratios of tracers for different chemical pathways(i.e. with and without NOx influence) and an empirical comparison to traditional partitioning models. A large suite of co-located instruments measuring trace gases and particle properties provide additional insight into oxidation chemistry and anthropogenic influence. Generally, traditionally-used tracers are found to exist in the particle-phase more than that predicted by equilibrium partitioning, but most compounds are found in both phases. Methyl tetrols, an oxidation product of isoprene that forms through reactions with HOx, are traditionally considered to be primarily in the particle phase but are observed here to have a significant day-time gas-phase component. The measured concentration of these products in both the gas- and particle-phase is found to be strongly correlated with particle-phase sulfate, indicative of anthropogenic influence in the formation or partitioning processes. Consequently, due in part to large differences in sulfur emissions, concentrations as well as partitioning ofmeasured isoprene products vary between the sites. We explore this dynamic further for traditional and new oxidation tracers of isoprene and monoterpenes to yield broader insight into the chemical processes behind biogenic SOA formation.

P2.65 - ORGANIC AEROSOL FORMATION IN THE HUMID, PHOTOCHEMICALLY-ACTIVE SOUTHEASTERN US: SOAS EXPERIMENTS AND SIMULATIONS

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Aqueous multiphase chemistry in the atmosphere has a substantial impact on the concentration, composition, and properties of organic aerosol, which affect climate and can lead to air quality changes that adversely impact human health and the environment.The chemistry is complex because of the variety of compounds present in the atmosphere and the phase transitions associated with multiphase reactions. Gas-phase precursors released from biogenic and anthropogenic sources are oxidized and fragmented forming water-soluble gases that can undergo reactions in the aqueous phase (in clouds, fogs, and wet aerosols) leading to the formation of secondary organic aerosols (SOAAQ). Recent studies have highlighted the role of certain precursors like glyoxal, methylglyoxal, glycolaldehyde, acetic acid, acetone in the formation of SOAAQ. However, we do not yet know whether the predominant precursors have been identified and whether precursors yet unknown also play a crucial role in aqueous SOA chemistry.

In this study, atmospherically relevant mixtures of water soluble gases were scrubbed from the ambient air using mist chambers at Brent, Alabama during the SOAS field campaign. Four mist chambers in parallel collected ambient gases in a DI water medium at 20-25 LPM with a 4 hr collection time. Total organic carbon (TOC) values in the daily composited samples ranged from 64-180 μM. Aqueous photooxidation experiments and control experiments were conducted with these mixtures in a newly designed cuvette chamber. OH radicals were formed in-situ in the chamber, continuously by H2O2 photolysis. Precursors and products of these aqueous OH experiments were characterized using ion chromatography (IC), electrospray ionization mass spectrometry (ESI-MS), and IC-ESI-MS. Results from experiments conducted on two days showed precursors to be primarily odd ions and in the positive mode ofESI-MS, indicative of the presence of alcohols, aldehydes, organic peroxides, and epoxides. Targeted precursor masses were fragmented using MS/MS to gain structural insights (such as functional groups and O:C, H:C, and N:C ratios) and identify possible compounds. Products were seen in the negative mode and included organic acids like pyruvate and oxalate. The results from this study will be used to better understand the precursors and cloud chemistry of these atmospherically-relevant mixtures.

P2.66 - OZONE PRODUCTION DURING DISCOVER-AQ: RESULTS FROM A PHOTOCHEMICAL BOX MODEL

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Understanding of the non-linear relationship between ozone production and its precursors is critical to develop an effective ozone control strategy. Sensitivity of ozone production to nitrogen oxides (NOx) and volatile organic compounds (VOCs) is expected to vary from location to location and from different timed of a day. Very few studies have been conducted to examine this sensitivity in urban areas with many largely based on model analyses only. In this work, we investigate the spatial and temporal variations of ozone production and its sensitivity to NOx and VOCs using the data collected during the NASA DISCOVER-AQ study in three areas: Baltimore/Washington, California,and Houston, Texas. An observation-constrained box model is used to study the photochemical processes along the NASA P-3B flight tracks as well as at surface sites where the P-3B conducted spiral profiles. Ozone production rates are calculated at different locations and at different times of day and its sensitivity to NOx and VOCs is investigated. In general, ozone production was sensitive to VOCs near the urban areas, while it became NOx sensitive in rural areas and downwind of the cities. We also found that ozone production wasgenerally sensitive to VOCs in the morning due to morning rush hour, while itbecame NOx sensitive inthe late morning and early afternoon. Whenmeasurements were available, ozone production efficiency (OPE), defined as theratio of the ozone production rate to the NOx oxidation rate, was also calculatedand its correlation with other parameters such as radical sources and NOx/NOy ratios is evaluated. We found the OPE in Houston was about 2-3 times larger than that in the Baltimore/Washington area, suggesting very effective ozone production in Houston. The resultsfrom this study, i.e., the spatial and temporal variations of O3 production sensitivity, can provide a scientific basis for policy-makers to develop a nonuniform emission reduction strategy for O3 pollution control in urban areas.

P2.67 - IMPLEMENTATION OF THE CCATT-BRAMS MODEL IN CUBA FOR HIGH RESOLUTION NESTED DOMAINS

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The air quality modeling is a big problem, which many countries around the world face, Cuba among them. In Cuba the use of the models as a cheaper and fast tools to estimate the air pollutant concentrations have particular importance due to the air quality-monitoring network capacities are very limited and with few possibilities of a future development.

There is experience in the country in the use of the dispersion models, so screening as refined like AERMOD and CALPUFF, to assess the emission sources responsibility in the air pollution. Regarding photochemical models, typically used to diagnostic and forecast the impacts from all sources in the air quality of a region, the Environmental Impacts Department in CUBAENERGIA is pioneer of its use in Cuba. The first experience in the country was the implementing of the system WRF-Chimere using the MELCHIOR-2 chemical mechanism. The results were satisfactory in spite of this system is off-line and it does not consider important emission sources like biomass burning.

Currently, the objective is the implementation of the on-line models like CCATT-BRAMS and WRF-CHEM, adapted to Cuban conditions and including the main emission sources. This work presents the results of the CCATT-BRAMS implementation on Cuba for high-resolution nested domains (27, 9 y 3 km), using EDGAR v 4.2, normalized to Cuban Greenhouse National Inventories as input for anthropogenic emissions and RELACS chemical mechanism. The results are compared with those obtained with WRF-CHIMERE and with a previous implementation of the CCATT-BRAMS in the region, conducted in the Brazilian Center for Weather Forecasting and Climate Research for low resolution nested domains (60 km for the outer grid and 20 km for the inner grid), and using the previous version of EDGAR (3.2) (Sanchez Gacita, 2011). The first experiences in the WRF-Chem implementation also are presented.

P2.68 - SOURCES OF ATMOSPHERIC AEROSOL FROM LONG TERM OBSERVATIONS IN ATHENS, GREECE

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Athens, the capital city of Greece, is subject to long range transported aerosols from discrete neighboring sources, in addition to significant local sources. This study presents the results of long term monitoring of fine (PM2.5) particulate matter chemical composition, in an urban background site in Athens - from May 2008 to April 2013. Chemical characterization was carried out on the acquired 1507 daily PM2.5 samples. Sunset Laboratory OC/EC Analyzer was used to determine organic and elemental carbon concentrations.Total organic Carbon analyzer was applied for the determination of water soluble organic carbon concentrations while, main ions (Cl-, Br-,NO-3, SO4-2, PO4-3, C2O4-2,NH4+, K+, Na+, Mg+2, Ca+2)and elements (V, Cr, Ni, Cu, Zn, Cd and Pb) were analyzed by Ion Chromatography and Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES),respectively. Source apportionment analysis using Positive Matrix Factorization(PMF3) was applied, in order to estimate the mass contributions to ambient PM2.5concentrations, while air mass back–trajectories were used to assess probable source locations. Additional statistical tools, such as factor analysis with varimax approach, have been implemented to the aerosol composition data for the fingerprint identification. The dominant components of PM2.5 in Athens were secondary ions (sulphate, nitrate and ammonium) and carbonaceous material. Dust and sea-salt accounted for 18% and 3% of PM2.5 mass,respectively; whereas the estimated water content of aerosols accounts for 27%of the calculated fine fraction mass. Analysis of seasonal differences showed that wood combustion processes were largely responsible for fine particle air pollution episodes during winters in 2011-12 and 2012-13 while, Athens appears to be affected from distant sources throughout the whole period of the year with maximum during summer.

P2.69 - PHOTOCHEMICAL AGING OF A-PINENE OZONOLYSIS SOA

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Secondaryorganic aerosol (SOA) is formed due to the condensation of the low volatileproducts of the volatile organic compounds (VOCs) oxidation on preexistingparticles. Monoterpene SOA may contribute up to 50% of the total organicaerosol (OA) in certain areas, with a-pinene being one of the most importantprecursors. Ambient OA is often dominated by oxidized OA (OOA) both in remoteand urban areas, as the oxidative nature of the atmosphere (OH radicals) andthe photochemical conditions tend to age the OA. Atmospheric models sometimesunderestimate OA mass concentrations especially during summertime. Includinganthropogenic SOA aging (through OH radicals) has closed that gap betweenmodels and field observations better. However, when biogenic SOA aging throughOH radicals is taken account some models tend to overpredict the OA mass. Thus,there is a discrepancy between models and field measurements, which needs to beaddressed.

Inthis work laboratory chamber experiments were conducted in two smog chambers inorder to explore the changes of the biogenic SOA as they age by reacting with OHradicals. a-pinene ozonolysis SOA were exposed to atmospheric levels of OHradicals produced by HONO or H2O2 under UV illumination.A suite of instrumentation was used to characterize both particle and gas phase:a High Resolution Aerosol Mass Spectrometer (HR-AMS) and a Scanning Mobility ParticleSizer (SMPS) measured the aerosol phase, while a Proton Transfer Reaction MassSpectrometer (PTR-MS), O3 and NOx analyzers monitored thegas phase species. A Cloud Condensation Nuclei Counter (CCNC) characterized theCCN activity and a thermodenuder system was used for the measurement of the volatilitychanges.

Ourresults indicate that the increase in the SOA mass due to the aging is lessthan 25%, which is lower than reported in the few previous studies. The resultsare sensitive to low levels of organic contamination from the distilled wateror from plastic parts of the injection system that react with OH producingorganic aerosol. The role of the OH exposure, source of OH, relative humidityand NOx levels have been quantified together with the correspondingchanges in O:C, particle hygroscopicity, and volatility.

P2.70 - AIR QUALITY AND CHANGING CLIMATE IN THE EASTERN US;

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The chemical transport model PMCAMx-2008 was used to examine the effect of climate change on ozone and fine (under 2.5 micrometers) particulate matter (PM) in the Eastern United States. Meteorology from ten representative years in the 1990s (present-day) and ten from the 2050s (future) is used. Future climate is based on the Intergovernmental Panel on Climate Change (IPCC) A2 scenario. The Model of Emissions of Gases and Aerosols from Nature (MEGAN, v2.04) was added to provide meteorology-dependent biogenic emissions. In this future climate, temperature increases almost everywhere, rainfall increases except in the Gulf of Mexico and the Midwest, wind decreases in the Gulf of Mexico but increases for land cells, and surface solar radiation decreases in the Midwest and the Atlantic but increases most other places. As a result, PM2.5 increases by 9% on average across the domain, but behavior is more regionally variable, ranging from +13% in the Plains to -7% in the Northeast. Lower wind speeds and reduced rainfall around the Gulf area result in lower deposition and higher concentrations for most PM components. Sulfate and organic aerosol are responsible for most of the PM change. Biogenic OA emissions are affected primarily by precursor emissions and meteorology; anthropogenic OA emissions are also affected by decreases in ozone and OH in the Northeast and Texas. Ozone increases by 4.7% on average, with a marked increase future MDA8 exceedance in the Northeast, Southeast, and Midwest. Overall, model advancements have introduced more variability to the simulations that was not previously observed. Although there are slight air quality improvements on a PM basis in the Northeast, the future picture of air quality is not positive for either PM or ozone.

P2.71 - APPEARANCE AND BOUNCING BEHAVIOR OF AEROSOL PARTICLES COLLECTED DURING GOAMAZON2014: AN EARLY LOOK

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A snapshot of early transmission electron microscopy (TEM) results regarding aerosol particles collected during the GoAmazon2014 campaign shows that they consist of sea salt (sodium sulfate or chloride), primary biogenic and K-bearing organic material, mineral dust, sulfates, and nano-sphere soot (ns-soot). Almost half the analyzed particles are sea salt, and K (as sulfate or organic material) occurs in about 80% of the particles. Mineral dust and primary bio-aerosol particles (e.g., pollen) comprise ~2% by number, and internally mixed ns-soot displays wide variations, ranging from 30 to 70% in number fractions.

Highly viscous particles have more gas-to-particle interactions than those with lower viscosity. In order to evaluate particle viscosity in ambient atmosphere, we compared aerosol particles 1) collected on a plate (non-rebounded), 2) bounced onto an adjacent sampling plate, and 3) collected using an impactor sampler. Preliminary results show that the rebounded particles had similar compositions to ambient particles, both of which were mostly internally mixed organic, sulfate, sea salt, and ns-soot. Judging from their compositions, these particles will be hygroscopic, suggesting that their rebounding character and number will depend on the ambient relative humidity. The implication is consistent with the rebound fractions of bulk samples, which indicate high rebound fractions when relative humidity was low.

P2.72 - LONG TERM MEASUREMENTS OF CARBONACEOUS AEROSOLS OVER THE EASTERN MEDITERRANEAN AND BLACK SEA: PRIMARY VERSUS SECONDARY SOURCES

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Carbonaceous material constitutes an important fraction of aerosol mass.However its role in the Mediterranean and Black sea atmosphere is yet to beunravelled. This study focuses on12 years aerosol chemical composition measurements (2001-2013) at Finokalia aremote area representative of the E. Mediterranean. To understand the factorscontrolling aerosol chemical composition at this remote location, samples were simultaneously collected at several locationspotentially influencing Finokalia during a year period (April 2009-February 2010). The areas studied compriseboth remote (Finokalia, Gökçeada), urban (Istanbul) and rural sites (Sinop, Erdemli). In total more than 3100 samples were collected andanalyzed for organic,elemental carbon (OC and EC) and 1500 for water-soluble organic carbon (WSOC).

Organic matter contributionaccounted for a significant part of the total PM10 mass (25.5±12.9%POM and 4.5±3.4% EC). OC/EC ratios are used to identify the nature ofcarbonaceous material. At the rural and remote sites this ratio wassignificantly higher than 2; Finokalia (6.1), Gökçeada (5.6) and Sinop (6.9) denoting that OC is mostly ofsecondary origin and highlights the presence of “aged” aerosols, throughout theyear. In Istanbul megacity the lower ratio (2.1) underlines the significantcontribution from local traffic-related or/and industrial originated sources.The significant correlation of OC and EC with nss K+, nitrate,oxalate and sulfate indicated that carbonaceous sources in Istanbul are mainlydue to fossil-fuel combustion and vehicular transport, while in rural andremote areas of Sinop and Finokalia from biomass burning.

P2.73 - ATMOSPHERIC INPUT AND SOLUBILITY OF TRACE METALS OVER THE EASTERN MEDITERRANEAN

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Atmospheric deposition is recognized, as an important source of nutrients, for the oceans. Recent works have highlighted that atmospheric inputs of nutrients and trace metals can considerably influence the marine ecosystem functioning at semi-enclosed or enclosed water bodies such as the eastern Mediterranean.

The current work aims to determine the sources and the factors controlling the variability of nutrients and trace metals in the eastern Mediterranean. Special focus was given on trace metals solubility considered either as key elements for phytoplankton growth such as iron, phosphorus or inhibitors such as copper. This has been accomplished by analyzing size segregated aerosol samples PM10 and PM1 collected for an entire year, at Finokalia, a background site in Crete, Greece.

Aerosol species concentrations indicate an important day-to-day variability closely related to the influence of meteorological conditions and air masses origin. Sahara dust, the largest natural source of aerosols in the area was found to be an important factor controlling the levels of trace metals. For the majority of trace metals examined, their solubility was found to be closely related to pH and dust mass amount. More specifically solubility appears to be inversely related to the crustal elements levels, while it increases in acidic environment. The significance of our findings for the eastern Mediterranean Sea are presented and thoroughly discussed.

This research has been co-financed by the European Union (European Social Fund – ESF) and Greek national funds through the Operational Program “Education and Lifelong Learning” of the National Strategic Reference Framework (NSRF) - Research Funding Program: ARISTEIA – PANOPLY (Pollution Alters Natural Aerosol Composition: implications for Ocean Productivity, cLimate and air qualitY) grant.

SESSION 3: INTERACTIONS BETWEEN AEROSOLS, CLOUDS AND PRECIPITATION

P3.1 - STUDIES OF AGEING PROCESSES IN ICE-FORMING AEROSOLS WITH SILVER IODIDE

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When airborneor ground-based ice-forming aerosol generators are usedfor weather-modification, rather a long time passes before the aerosol comesinto the targetzone. During this timethe ice-forming aerosol activity may greatlydecrease. This work is for determining the mechanism andpeculiarities ofAgI-containing aerosols ageing processes, on the basis ofwhich the developmentof compounds and generators designed for differentconditions of their use will bepossible.

Forthegeneration of aerosol three pyrotechnic compounds with equal amounts ofsilver-but cardinally different composition were used: the hygroscopicconstituent ofthe combustion products is presented by soluble components with J-ions,no soluble components of J and without a hygroscopic constituent at all.

Inrealsituation, changes of aerosol ice-forming properties as well as itsspectrum occursimultaneously. For estimation of aerosol ice nucleationproperties it would bedesirable to compare their changes with aerosol spectrum. Then the changes in ice-forming properties canbe formalized as theconcentration of active sites on the particle surface (S). If Sis determined as the ratio of all active icenuclei to the total surface of allaerosol particles, one can obtain the dependence of S on time atdifferenthumidity for differentaerosols.

In theourexperiments it was found that for aerosols without soluble compounds of Jtheparameter S does not change with time and is constant at any humidity. Inotherwords, aerosol particles of this composition do not undergo ageingprocesses.Aerosols with soluble J- compounds are an exception ofthiscase. For them, after 60 minutes of staying in the medium with 80%humidity, Ssharply increases.

Based onthisinformation, it is possible to define some of the rules of optimizationforgenerators used during weather modification activities for obtaining morestablecharacteristics of ice-forming aerosol in time. The study of suchprocesses isespecially important for the development of anti-hail ground-basedgenerators,because it takes several hours for aerosolto get into thetarget area.

P3.2 - MEASUREMENTS OF CLOUD RADIATIVE PROPERTIES IN THE AMAZON BASIN TO DERIVE CLOUD MICROPHYSICS

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Cloud microphysics andits interaction with aerosols is a key atmospheric process forweather and climate. Interactions between clouds and aerosols canimpact Earth's radiative balance, its hydrological and energeticcycles, and are responsible for a large fraction of the uncertaintyin climatic models. On a planetary scale, the Amazon Basin is one ofthe most significant land sources of moisture and latent heat energy.Moreover, every year this region undergoes marked seasonal shifts inits atmospheric state, transitioning from clean to heavily pollutedconditions due to the occurrence of seasonal biomass burning fires,that emit large amounts of smoke to the atmosphere. These conditionsmake the Amazon Basin a special place to study aerosolcloudinteractions.

In this work we report onefforts to experimentally investigate the impact of aerosols uponcloud microphysics in Amazonia. Radiative properties of clouds, inthe visible wavelength range, near and thermal infrared were measuredin single convective clouds in the Amazon. From these measurements,performed on cloud sides, we intend to derive vertical profiles ofdroplet effective radius, of water and ice particles. These resultsare to be correlated with aerosol optical depth in the vicinity ofclouds, cloud top properties, and meteorological parameters retrievedfrom satellites and radiosondes. The measured maps of cloudbrightness temperature will allow building temperature vs. effectiveradius profiles for hydrometeors in single clouds. The results to beobtained will help foster the quantitative knowledge aboutinteractions between aerosols and clouds in a microphysical level.These interactions are a fundamental process in the context of globalclimatic changes, they are key to understanding basic processeswithin clouds and how aerosols can influence them.

P3.3 - PARTICULATE MATTER MEASURED IN CAMAGÜEY, CUBA DURING 2012 AND 2013. CHEMICAL ANALYSIS AND SOURCE APPORTIONMENT STUDY.

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Atmospheric aerosol particles were collected atCamagüey (21.42° N, 77.85° W, 122 m asl), Cuba, during 2012 and 2013, forinvestigating the particulate matter (PM) concentration and elemental composition.Samples were collected with a low volume particulate impactor twice a week witha collection time of 24 hours. Gravimetric analysis of the particulate matterfractions PM1 (PM<1 μm) was carried out for 185 samples. Results showedmean values of PM1 levels of 16.1 μg m-3 (std = 12.6 μg m-3),varying from2.5 μg m-3 to 63.9 μg m-3.The behavior of PM1 concentration in the time is analyzed.

The same samples were used for the chemicalcomponent determination with Energy dispersive X-ray fluorescence (EDXRF)technique. Equivalent black carbon(EBC).was measured by means of reflectance. Together with gravimetric mass ofthe deposited matter the identification of sources apportionment was possibleby use of Principal Component Analysis and Positive Matrix Factorization methods. Four sources have been identified byboth methods: marine salt aerosols, dust from earth surface, combustible, mixedindustrial and contamination aerosols. But a different apportionment wasobtained by the methods. These results are showed and discussed.

There is a local and regional interest of theresults by the information on the characteristics of the aerosols in themeasurement site. Also, the presented values could be used by those workingwith atmospheric dispersion models. Also, these data could be used as input in RegionalClimate Models

P3.4 - CHARACTERIZATION OF CIRRUS CLOUDS IN CENTRAL AMAZON (2.89° S 59.97° W) USING A GROUND-BASED LIDAR SYSTEM

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Cirrus cloudshave been recognized as important agents of the climate system as they cansigni?cantly alter the radiation balance of the atmosphere. Despite beingrelatively transparent to solar radiation (optical depth < 3.0), they trapthe infrared radiation that would be lost to space, and thus have a positiveradiative forcing. They are found near the tropopause and are formed mainly bynon-spherical ice crystals, with a lifetime that can go from hours to a fewdays. Its importance grows due to its large coverage area. The global cirruscover has been estimated to be about 20-25% and their occurrence can be morethan 70% over the tropics. In this paper, we report on tropical cirrus cloudscharacteristics as measured by a Lidar station operational in the centralAmazon region since 2011. An automated algorithm for the detection of cirrusclouds was developed, which is used to determine the clouds geometricalproperties. The transmittance of the lidar signal was used to derive the cirrusoptical depth. The Klett and Raman methods were used to derive thebackscattering coe?cient and to estimate the lidar-ratio of the cirrus clouds.As the results from the ?rst two years of measurements (2011-2012), we foundthat the occurrence of cirrus clouds was approximately 71.0% of the total timeof observation, and approximately 24.2% of all cirrus were subvisual (t<0.03),40.7% were thin cirrus (0.03<t<0.3) and 35.1% were cirrus stratus(t>0.3). The average values of the cirrus base and top altitudes were 12.4±2.4kmand 14.3±2.2km, respectively, being found at temperatures down to -90°C theyreside most frequently near the tropopause. The lidar-ratio was estimated as20.0±6.8sr, indicating a mixed composition of thick plate and long column icecrystals. The behavior of these quantities with respect to temperature wasstudied. The diurnal cycle of the frequency and altitude, during both summerand winter, indicate anvil outflow to be the most important generationmechanism.

P3.5 - UNDERSTANDING CLOUD CONDENSATION NUCLEI MIXING STATES FROM FLOW TUBE EXPERIMENTS

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Cloud condensationnuclei (CCN) data analysis of single component aerosols, such as ammoniumsulfate, (NH4)2SO4, are well understood. Theactivation of a single known component yields a simple sigmoidal activationcurve. However ambient aerosols generally exist as complex heterogeneousmixtures of organic and inorganic species. CCN data sets from ambient andchamber studies, which consist of these aerosol mixtures, may not show a single clean activation curve but insteadcan exhibit multiple activation curves not associated with doubly chargedparticles.

To characterize andmodify mixing states, a new laminar flow tube apparatus has been developed tocontrol the extent of mixing of organic and inorganic fractions. Increasing theresidence time can increase the extent of internal mixing. Preliminary datasuggests that aerosol water is a significant factor; under dry conditions, theaerosols were externally mixed and humid conditions promoted internal mixing. Forexample, (NH4)2SO4 and C4H6O4(succinic acid) when dry, maintain an external mixture, multiple activationcurves are constant, and can be reproduced with Köhler theory. Wehave successfully recreated data sets yielding multiple activation curves bymixing multiple compounds that are representative of different anthropogenicand biogenic sources in the flow tube. The data agree well with KöhlerTheory and single parameter (kappa) theory thermodynamic predictions of dropletactivation. Data sets are also compared with a diffusion based coagulation particlemodel to predict mixing behavior. The method of analysis and the effect ofmixing states of multiple components on the supersaturated hygroscopicproperties of aerosols are presented. Results suggest that the aerosol morphology can be observed in CCNactivation data and can be revisited in complex aerosol data sets to understandthe extent of mixing.

P3.6 - EXPLAINING THE EFFECT OF WATER ACTIVITY ON ICE NUCLEATION

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Ice nucleation determines the presence of cirrusclouds at low temperature, and the glaciation level of mixed-phase clouds. Itis a fundamental atmospheric process regulating many important pathways in thehydrological cycle. Over the recent decade water activity, rather than thedroplet composition, has been identified as the main determinant of icenucleation rates, both for homogeneous and heterogeneous freezing. Unlikehomogeneous freezing which occurs spontaneously within the cloud droplet,heterogeneous ice nucleation is catalyzed by the presence of an ice nucleus.The marked effect of water activity on ice nucleation has been studiedprimarily on an experimental basis. However theoretical models, andparticularly thermodynamic models, able to independently explain observednucleation rates are lacking. This work introduces for the first time aphenomenological framework describing the effect of water activity on icenucleation. Its efficacy is demonstrated for homogeneous ice nucleation. Theextension of the framework to the study of heterogeneous ice nucleation in theimmersion freezing mode is discussed and analyzed. The new framework representsan independent approach to ice nucleation, still simple enough to be applied inatmospheric models of cloud formation.

P3.7 - HOW EFFECTIVE ARE SOA TO ACT AS ICE NUCLEI?

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How ice nuclei activate? Why some activate and some not? Why some activate, but then do not activate again? Does charge help on activating ice nuclei? What are the abilities of secondary organic aerosol formed in boreal environment, or aerosol present in artic region to act as ice nuclei? To tackle some of these questions, we have built several homemade ice nuclei counters (INC). The design is based on the Portable Ice Nuclei Counter (PINC)developed at ETHZ Zurich, Switzerland. These INCs are conceived to measure continuously over a great area of the European Nordic country. An inter-comparison will be performed prior of the deployment of the counter in the fields. In this presentation we will present the concept and design of these INC, the result of the inter-comparison and the first result from measurement which will be performed in a boreal forest environment (Hyytiala, Finland).

P3.8 - IMPACS OF BIOMASS BURNING AEROSOLS, SURFACE ALBEDO CHANGE AND WATER VAPOR ON THE SHORTWAVE RADIATION BALANCE OF THE AMAZÔNIA

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Simultaneous CERES and MODIS sensors retrievals were used to calculate the changes in radiation fluxes resulting from deforestation in the Amazon during the dry seasons from 2000 to 2009. The direct radiative forcing (RF) of biomass burning aerosols and the RF due to surface albedo changes, triggered by deforestation in the Amazonia, were calculated.

The mean direct RF of aerosols at the top of the atmosphere (TOA) during the biomass burning season for the 10-year period was -5.2 ± 2.6 W/m^2. The spatial distributions of the direct radiative forcing of aerosols over the Amazon Basin show that for high concentrations of aerosols, the daily average of the RF at the TOA can reach high values of up to -30 W/m^2. The impact of aerosols over different surface types was analyzed, indicating that the direct RF is systematically more negative over forest than over cerrado areas. Model results were validated with AERONET measurements with very good agreement.

The mean annual land use change RF, due to deforestation, in Rondônia was determined as -8.1 ± 1.0 W/m^2. Biomass burning aerosols impact the radiative budget for approximately 2-3 months per year, whereas the surface albedo impact is observed throughout the year. Because of this seasonality, the estimated impact in the Amazonian annual radiative budget due to surface albedo change is much higher than the annual average impact due to aerosol emissions.

The influence of deforestation in the atmospheric water vapor content, and its impact in the radiative budget, was assessed using water vapor column measurements obtained by AERONET sunphotometers. It was observed that the column water vapor is on average smaller by around 10% of the total column water vapor over deforested areas compared to forested areas. The effect of reducing atmospheric water vapor column contributes to an increase in the upward shortwave radiative flux at the TOA. The large radiative forcing values obtained in this work indicate that deforestation could have strong implications on convection, cloud development and the ratio of direct to diffuse radiation fluxes, which affects the carbon uptake by the forest.

P3.9 - AEROSOLS, CLOUDS AND CLIMATE CHANGE: NEW BIOGENIC AND ANTHROPOGENIC SOURCES FOR SECONDARY AEROSOLS IN POLAR REGIONS

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Both northern and southern polar regions are verysensitive to the ongoing climate change. The changes in the interactionsbetween the atmosphere, biosphere and cryosphere have also inevitableconsequences to global climate. Aerosol-cloud-climate interactions pose thelargest uncertainties related to estimating our future climate. In order to quantifythese, one needs to know how the sources of aerosols will change in the future.Our studies have shown that both biogenic (Kyrö et al., 2013a) andanthropogenic (Kyrö et al., 2013b) precursors for secondary aerosols andvapours contributing to their growth up to CCN are subject to change in thepolar regions in the future.

Firstly, increasing temperature exposes groundvegetation and forms meltwater ponds in glaciated and snow covered areas duringthe summertime. This increases the emissions of biogenic volatile organiccompounds, which in turn may increase the formation and growth of secondaryorganic aerosols and finally, increase the concentration of potential CCN and thushave an impact on climate. It has been shown that this feedback mechanism is importantin producing CCN at least in summertime continental ice sheets (Kyrö et al.,2013a).

On the other hand, rapidly shrinking Arctic sea ice attractsmore maritime activity as it opens up new, faster shipping routes and allowsoil and gas drilling from new areas. The increased human activity brings moreanthropogenic SO2 emissions to the Arctic. Increased sulphurpollution has the potential to increase new particle formation (NPF) throughincreased amount of H2SO4 but on the other hand, consequentiallyincreased condensation sink disfavours NPF and subsequent growth. In areas withhigh sulphur pollution but low background aerosol concentrations, the firstmechanism is the dominating one, and the trends in NPF and CCN are governed bythe trends in biogenic emissions, human activity and cleaning of theanthropogenic emissions (Kyrö et al., 2013b).

Both of these feedback mechanisms need to be takeninto account when assessing the future aerosol climatic effects in polarregions. Also, the upcoming changes in the atmospheric transport and aerosolremoval need to be considered.

Kyrö et al., ACP,13:3527-3546, 2013a, Kyrö et al., ACPD, 13:30721-30763, 2013b.

P3.10 - RAIN CHEMISTRY AND CLOUD COMPOSITION AND MICROPHYSICS IN A TROPICAL CLOUD FOREST UNDER THE INFLUENCE OF AFRICAN DUST

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It is knownthat African dust travels long distances from its emission source, but not muchis understood about how the aging process that takes place during transportchanges dust particles properties, and how the presence of this dust affectscloud's composition and microphysics. In summer 2013, as part of the Puerto Rico African Dust and Cloud Study(PRADACS) and in order to improve our understanding of the role of long-range-transported African dust (LRTAD) in cloud formation processes in a tropicalcloud forest in the Caribbean region, we sampled at two stations, Pico del Este(PE, 1051 masl) and the nature reserve of Cabezas de San Juan (CSJ, 60masl). In both stations we monitoredmeteorological parameters. At CSJ, we measured light absorption and scatteringat three wavelengths (467, 528 and 652 nm). At PE we collected cloud and rainwaterand monitored cloud microphysical properties. We used a hotwire liquid watercontent sensor (LWC-100) and a backscatter cloud probe (BCP), to investigatehow parameters such as the liquid water content, droplet size distribution,droplet number concentration, effective diameter and median volume diameterbehave under the presence and absence of African dust. Data from aerosolmodels, satellites, and back-trajectories were used together with CSJmeasurements to classify air masses and samples collected at PE in the presenceor absence of dust. Soluble ions, insoluble trace metals, pH and conductivitywere measured for cloud and rainwater. Results showed that the averageconductivity of cloud water in the presence of LRTAD was almost twice (81.1 mS/cm) as those in the absence of LRTAD(47.7 mS/cm) andon rainwater we saw a slight increase on average conductivity in the presenceof LRTAD (15.0 mS/cmvs 12.8 mS/cm). Measurementsof pH showed a slight difference (not larger than 11%) in the presence andabsence of dust for both cloud and rainwater. Detailed results on the chemicalcomposition of clouds and rainwater, on cloud microphysics, and on how theseproperties are affected in the presence of dust events will be presented at themeeting.

P3.11 - ANALYSIS OF COMBINED MAX-DOAS MEASUREMENTS, SCIATRAN SIMULATIONS AND AERONET

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MAX-DOAS measurements performed at different geometries under smoky and cloud-free conditions at Campo Grande – MS - (-20.44º, -54.65º) were analyzed. The measurements comprised spectral radiances in the 176.99 to 895.65 nm interval at 0.197 nm resolution. A spectral fitting based on Beer´s Law and taking into account all absorbing gases in a given spectral region was applied to the data. As a result, the differential slant column density (DSCD) was estimated, i. e. integrated concentrations along the effective radiation path of several atmospheric trace gases. In the present work, O4 dimer was analyzed to retrieve aerosol information, since its vertical profile is practically constant throughout the day and its absorption bands are very well defined in the visible spectral region. For each geometry of observation, and incorporating aerosol optical properties

derived from AERONET, simulations were performed varying the vertical profile, the aerosol optical properties and surface albedo. The simulations outputs were compared with the observed data, in terms of relative intensity (ratio of intensity at a given elevation/off-axis and the intensity at the zenith) and DSCD's O4. The atmospheric circulation pattern over South America during winter and spring seasons enables the aerosol transport from biomass burning regions (mainly from Southern portion of the Amazon Basin and eastern Bolivia and Paraguay) to regions further south in the free troposphere. The analysis of vertical profile aimed to verify such transport.

P3.12 - ICE 1H CRYSTAL STABILITY AND GROWTH IN THE PRESENCE OF GLYOXAL SECONDARY ORGANIC AEROSOL AND CARBON DIOXIDE

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Ice is one of the most abundant materials on earth and plays an important role in the microphysics of formation of high altitude cirrus and polar stratospheric clouds, as well as the maturity of thunderstorms. Organic Matter (OM) adsorption on ice surface affects its melting as well as growth dynamics [1]. Several studies address this issue mainly for long chain alcohols and organic acids, while the effects of water soluble organic compounds (WSOC) are highly obscure at the moment. We report on ice 1h stability and growth in the presence of the ubiquitous atmospheric trace gas glyoxal along with Secondary Organic Aerosol (SOA) also in the presence of Carbon Dioxide.

OM is treated as adsorbed phase onto large ice 1h crystals up to 2000 water molecules. The crystals undergo phase transitions under superheating [2] and supercooling conditions [3] by Molecular Dynamics (MD) simulations. Glyoxal SOA exert diverse effects on the ice 1h lattice to promote stability or crystal collapse, while their solubility and dynamics are strongly influenced by the presence of CO2. We propose that aqueous chemistry in wet aerosols has a strong effect on the microphysics of cloud formation and we also discuss the implications of the CO2 nucleation in the form of “bubbles”in the liquid phase. This latter is a direct result of the dissolved CO2 in frozen cloud drops coming out of equilibrium as temperature increases in the transition to rainwater. Simulations in the atomic scale provide a valuable insight into a deeper understanding of a rather complicated process involving surface-active species.

1. Koop, T. Z.Phys. Chem. 2004, 218, 1231-1258.
2. Mochizuki,K.; Matsumoto, M.; Ohmine, I. Nature. 2013, 498, 350-354.
3. Pluharova´,E.; Vrbka, L.; Jungwirth, P. J. Phys.Chem. C. 2010, 114 (17), 7831-7838.

P3.13 - THEORETICAL INVESTIGATION OF INTERACTION OF ORGANIC ACID AND AMMONIA WITH HYDRATION OF 0 TO 6 WATER MOLECULES

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Aerosols have significantly impact on ambient air quality, atmospheric visibility, human health and climate change,especially in recent years haze pollution has become one of serious environmental problems in China, and nucleation is the key step in the formation of aerosols, which is the formation of molecular clusters through hydrogen bonding and proton transfer process. Sulfuric acid and ammonia are the common nucleation precursors, however the traditional H2SO4-H2O and H2SO4-NH3-H2O nucleation theory over or low estimate the nucleation rate, so some other candidate mechanisms including the organic acid enhanced nucleation are proposed. However,due to the limit of current instrument, the microscopic mechanism of nucleation of organic acid is unclear, and experimental and observational results are not coincident,which seriously affects the aerosol pollution control. In this study, the ternary hydrated sulfuric acid/succinic acid with ammonia clusters have been investigated using high-level quantum chemical calculations and molecular modeling methods, and the clustersof sulfuric/succinic acids with ammonia containing hydration of up to 6 water molecules are studied. In the first step, the configuration of molecular clusters is searched via the Amorphous Cell and the Simulated Annealing methods.In the second step, the lowest energy conformers are selected on the basis of the conformer structures obtained form the first step and higher level calculations are performed at PW91PW91/6-311++G(2d,2p). We find that all the hydrated sulfuric acid-ammonia-water clusters exhibit proton transfer from sulfuric acid to ammonia, but proton transfer just occur in clusters of succinic acid and ammonia with n (n>=5) molecules of water,which shows the acid-base ion pairs are stabilized by water molecules through hydrogen bonding interaction. For sulfuric acid the maximum Gibbs free energy change of the reaction is reached when ammonia is hydrated with 6 molecules of water and sulfuric acid is anhydrated. For succinic acid, the maximum Gibbs free energy change of reaction is reached when both succinic acid and ammonia are all hydrated. The average interaction energy of sulfuric/succinic acids with ammonia indicates they contribute to the nucleation and formation of nanoparticles in the atmosphere, and hydration plays an important role in the nucleation.

P3.14 - MICROPHYSICAL EFFECTS IN CLOUD LIFE CYCLE DUE TO ANTHROPOGENIC CHANGES IN PARTICLE POPULATION OBSERVED IN THE CONTEXT OF GOAMAZON EXPERIMENT

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The effects of aerosol particles on cloud microphysical properties, cloud cover, precipitation, and regional climate are significant. The Amazon region is particularly susceptible to changes in number-diameter distributions n(d) of the atmospheric particle population because of the low background concentrations and high water vapor levels, indicating a regime of cloud properties that is highly sensitive to aerosol microphysics. Present and future anthropogenic activities can significantly alter the number-diameter distribution that prevails under natural conditions. At present time, the prevailing distribution n(d) undergoes rapid transient changes between wet season and dry season as well as when affected by biomass burning. There are also possible secular trends in n(d) related to economic development. The climatic implications are profound, ranging from modulation of local precipitation intensity to modifying large-scale circulations and energy transport associated with deep convective regimes. Moreover, any changes in tropical precipitation can have significant, potentially global consequences because of non-linear multiscale interactions of tropical waves with precipitation in the Amazon. In this paper, we present our first modeling results of how variability in the n(d) of the particle population for natural and polluted conditions as well as variability in the intrinsic effective hygroscopicity k of the particles affects cloud properties. A data set of the number-diameter distribution n(d) of the aerosol particle population under variable natural and polluted conditions obtained at ground level was analyzed (at GoAmazon-T3, T2 and T0 sites). An additional data set was obtained from two cloud condensation nuclei counters coupled to differential mobility analyzers (at GoAmazon-T3 and T0 sites). From these data sets, the size-resolved effective hygroscopicity parameter k was obtained. Based on the data sets of n(d) and k, microphysical modeling was conducted for different case studies. In the case of the Amazon basin, clouds are in the particle-limited regime due to the pristine condition of unperturbed atmosphere. A particle-limited regime means that for modest to vigorous updrafts the cloud droplet number concentration (CDNC) is dominated by CCN number instead of updraft velocity. Our simulations show that the observed increase in aerosol particle number concentration inside the pollution plume of Manaus, typically [CCN]~150 => 1500 #/cm3 and [CN]~800 =>12000 #/cm3, shifted the activation mechanism to an updraft-limited regime, similar to other continental sites.

P3.15 - RADIATIVE EFFECTS OF AEROSOLS VERSUS CLOUDS ON KEY TROPOSPHERIC OXIDANTS IN GLOBAL MODELS

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Aerosols and clouds affect tropospheric photochemistry through absorbing and/or scattering solar radiation that determines photolysis frequencies (J-values). There is synergy between the effects of clouds and absorbing aerosols when they are located in the same layer or clouds are located below the aerosols. Since the distribution and optical properties of clouds in current climate models have large uncertainties, understanding this synergistic impact is important for improving our understanding of the effect of aerosols in these models. In this study, we compare and contrast the radiative effects of aerosols and clouds and quantify their synergistic impact on key tropospheric oxidants in two global 3-D chemistry and transport models (GMI and GEOS-Chem). The GMI model is driven by the NASA GEOS1-STRAT DAS (data assimilation system), fvGCM, GISS II' GCM, and GEOS-4 DAS meteorological data sets, which feature significantly different vertical distributions of clouds. GEOS-Chem is driven by the NASA GEOS-5 DAS data set. While GMI uses global monthly mean fields for 1996-1997 of dry aerosol mass from the GOCART model, GEOS-Chem includes aerosol chemistry coupled with ozone-NOx-hydrocarbon chemistry. Model aerosol and cloud optical depth fields are evaluated against the satellite retrieval products from the Moderate Resolution Imaging Spectroradiometer (MODIS). Model results indicate that both aerosols and clouds have modest radiative effects on the global ozone burden. While the radiative effects of aerosols on hydroxyl radical (OH) are much smaller than those of clouds in most of the free troposphere, their (negative) effects are comparable near the surface at the northern mid-latitudes. We show that aerosol effects are enhanced (reduced) above (below) the low level thick clouds over those under cloud-free conditions, and high clouds reduce cloud-aerosol synergistic effects. A regional analysis of such synergistic effects as well as the impact of cloud vertical distribution on the synergism will also be discussed.

P3.16 - DEVELOPMENT OF A REGIONAL CHEMICAL TRANSPORT MODEL WITH SIZE -RESOLVED AEROSOL MICROPHYSICS AND ITS APPLICATION ON AEROSOL NUMBER CONCENTRATION SIMULATION OVER CHINA

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An advanced particle microphysics (APM) model has been incorporatedinto a regional chemical transport model (NAQPMS) to simulate the seasonalvariation of particle number concentrations over China in 2007 for the firsttime. The NAQPMS+APM can reproduce the particles number concentrations at remote, suburban sites and urban sites reasonably. Most of modeled values were within a factor of two of observations. The simulation indicated that particles numberconcentration was significantly higher in southeastern China than that in northwestern China. Monthly mean numberconcentration can be over 20000 cm-3 in mostpolluted regions in southeasternChina while the value is generally below 7000 cm-3 in northwesternparts of China. Higher numberconcentration occurred in January while lower value occurred in April and July. In heavily polluted regions, like Sichuan Basin and central-easternChina, primary particles dominated particles number, while secondary particlesaccount for most of particles number over relative clean areas by thenucleation process. The area over which secondary particlesdominated showed distinct seasonal variation and its spatial pattern wascoupled with primary particles distribution which was strongly influenced bythe meteorological conditions, e.g., East Asia Monsoon.

P3.17 - STUDY OF AEROSOL OPTICAL DEPTH IN THE BRAZILIAN SEMIARID REGION USING 500 NM, 670 NM AND 870 NM BANDS FOR SUN PHOTOMETER CALIBRATION

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Aerosol Optical Depth (AOD) measurements are animportant parameter to quantify the distribution of aerosols in the atmosphere.Due to the high costs of commercial monitoring instruments, a portable sunphotometer was developed, operating in four bands, with two bands in the visiblespectrum and two in near infrared. The instrument calibration process isperformed by applying the classical Langley Method. Application of the Langley'smethodology requires a site with high optical stability during themeasurements, which is usually found in high altitudes. However, far from beingan ideal site, Harrison et al. (1994) report success with applying the Langleymethod to some data for a site in

Boulder, Colorado. Recently, Liu et al.(2011) show that low elevation sites, far away from urban and industrialcenters can provide a stable optical depth, similar to high altitudes. In this studythe feasibility of applying the methodology in the semiarid region was investigatedby studying the stability of optical depth for several periods of the year. Inthe present study of the optical depth stability in the semiarid region ofnortheastern Brazil measurements occurred during the dry season in australsummer, when the native vegetation naturally dries, losing all leaves. Thevariation of the extraterrestrial constant V0 reached desirablevalues in all three bands that were studied, i.e., the achieved results withthe V0 combination of eleven days of measurements. The data weredistributed during some days in December 2012 and September 2013 and we found asmaller V0 variation than those achieved by calibration laboratories.However, the constant V0 presented some changes due to AODvariability. The results indicate thatthe calibration site needs to be better characterized with studiesin more favorable periods, soon after therainy season.

P3.18 - CLOUD EFFECTS ON SOLAR RADIATION ATSURFACE IN CAMAGÜEY [21.42 °N, 77.85 °W],CUBA.

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The cloud effects on solarradiation at Camaguey [21.42 °N, 77.85 °W], Cuba, were studied from ground-based solar irradiancies measurementsand clouds reports from actinometric observations during 1981 to 2010.Shortwave Cloud radiative forcing (SWCRF) and effective transmittance (ET) atthe surface were computed. Actinometric measurements with solar disk total orpartially obstructed by clouds were used to obtain SWCRF and ET. Clouds effecton shortwave diffuse radiation (ED) is obtained with the irradiance in presenceof clouds in the sky, not only solar disk obstructed by clouds. There were usedtwo methods to compute solar net irradiances for clear sky conditions. SWCRFand ET were estimated using the clear sky irradiance from the mean diurnalcycle of global solar irradiance for each month.

After analysis 44761 cases of SWCRFand ET was determined to all cloud types combinations. The mean values of SWCRF(ET) for all clouds were -385.6W/m2 (30.2 %) to overall period, -396.2 W/m2 (29.6 %)during the rainy season and -379.1 W/m2 (30.3 %) in the little rainyseason. SWCRF have the maximum at 12 hour and the minimum at the extreme hoursof day. ET is less sensitive to solar zenith angle change with the maximum at11 hour. Cumulonimbus (Cb) cloud type has the highest instantaneous effect onsolar radiation. However, the maximum mean values mean SWCRF (ET) were -417.6 W/m2 (28.7 %) to the cumulus cloudtype (Cu), due their highest frequency during the year. Altocumulus-Cirrus(Ac-Ci) combination has the smallest mean effect on solar radiation with SWCRF(ET) values of -200.5 W/m2 (45%).

For ED 8005 cases were retrieved. For all cloud typesED have a mean value of 0.33 per cloud amount unit. The minimum value was inAugust and July with 0.23; the maximum value was in October and January with0.37. Diurnal cycle shows the maximum at 11 hours and minimum at 17 hours. Stratocumuluscloud type (Sc) has the highest effect and Cirrus cloud type (Ci) has thelowest effect on shortwave diffuse radiation in surface with ED mean value of0.41. and 0.24, respectively.

P3.19 - MEASUREMENTS OF INORGANIC COMPONENTS AND BC IN CLOUD-WATER AND RAINWATER AT A HIGH ALTITUDE STATION IN WEST INDIA.

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Abstract: Data from a ground-based cloud-water collection system intercepting water from clouds at a mountain field station, Sinhagad near Pune in India are presented. This study was part of an Indo-Swedish Collaboration Project on Atmospheric Brown Cloud-Asia (ABC-A). Cloud-water and rainwater (wet-only) samples were collected during June 2007- Dec. 2010. Concentrations of major anions and cations were determined. Ion concentrations were generally higher (NO3_, about 8 times; SO4 2-and K+, 5 times; NH4+, 4 times and Cl-,Na+, Ca2+, Mg2+ 3 times) in cloud-waters samples than in rainwater samples collected during the same days. The average pH of cloud-water samples was 6.0 with about 20% of the values below 5.6 and only 4% less than 5.0. Despite high concentrations of SO42-and NO3- the cloud water samples were on average not more acidic than rainwater samples. This is different from most of the other studies of cloud-water composition which have noted a substantially higher acidity (i.e. lower pH) in cloud-water than in rainwater. The slightly alkaline (pH> 5.6) nature of the cloud-water samples is mainly due to the presence of soil derived calcium carbonate in quantities more than enough to neutralize the acids or their precursors. A separation of the cloud-water data into trajectory groups showed that samples in air-masses having spent the last few days over the Indian sub-continent were in general more acidic (due to anthropogenic emissions) than those collected during days with air-masses of marine origin. A high correlation mutually between Ca2+, Na+, NO3-and SO42- makes it difficult to estimate the contribution to SO42- from different sources. Anthropogenic SO2- emissions and soil dust may both give important contributions. A preliminary evaluation will also be presented of measurements of BC in cloud-water and rainwater.

Keywords: Rainwater; Inorganic ions; Acidic deposition; pH; Black Carbon

P3.20 - SOURCES OF CARBONACEOUS AEROSOLS OVER SOUTH ASIA USING YEAR -ROUND RADIOCARBON METHODOLOGY: BIOMASS BURNING OR FOSSIL FUELS?

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Abstract: Black carbon (BC) aerosols formed by incompletecombustion of fossil fuels, biofuel and biomass exert a large warming impact on regional climate and mayseverely impact respiratory health. Short-term campaign observations using natural abundance 14C of BCindicate that biomass combustion (contemporary 14C) may rival the contributionsfrom fossil fuel combustion (14C extinct). This study reports the firstyear-round 14C-based source apportionment for Asia, from both a receptor sitein W India (Sinha-

gad, SINH, a hilltop outside Pune) and from the MaldivesClimate Observatory at Hanimaadhoo (MCOH, a super-observatory receptor siteover the Indian Ocean). Improvedsource-related physical and chemical characterization of the carbonaceous aerosols is an important step to reduce thecurrent uncertainty in their effects on radiative forcing as fossil fuelderived BC may have twice the effect. Accurate top-down source apportionment is a key foundation for targetedmitigation actions and serves to “ground truth” predictions from technology-based“bottom-up” emission inventories, which carry large uncertainties both w.r.t.activity and emission factors for S Asia. Our 14C-based results show that biomass/biofuelproduces 52 ± 8% of the BC emitted from South Asia (average for both SINH andMCOH). The overall average contributions of biomass/biofuel burning to OC were81% at SINH and 70% at MCOH. The mean OC/EC ratios were 8.0 ± 5.4 and 7.5 ± 11 at SINH and MCOH, respectively Our 14C-based results for EC and OCthus show a much larger role for biomass and biofuel burning, compared withearlier top-down studies, while attenuating the biofuel influence relative tobottom-up suggestions. Dual isotopic probing, combining ?14C with d13C,further highlights biomass combustion. The d13C suggests that woodfuel and other C3 plants are complemented by C4sources(such as from agricultural slash-and-burn practices) as substantialcontributors. Improvedsource apportionment of S Asia BC aids both mitigation actions and assessmentof climate effect.

Keywords:Radiocarbon;Organic carbon; Elemental carbon; Source apportionment; Biomass

P3.21 - TOWARD THE MINIMAL REPRESENTATION OF THE AEROSOL MIXING STATE

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Onechallenge in the simulation of atmospheric aerosols is the representation ofparticle composition. Tracking the composition of individual particles iscomputationally expensive, so global models make some assumption about theaerosol mixing state, that is, the manner in which chemical species aredistributed across the particle population. In this study, we use aparticle-resolved aerosol model to identify the minimal representation of themixing state needed to accurately model climate-relevant properties.

Theevolution of the aerosol mixing state was simulated in a series of scenarioswith PartMC-MOSIAC. Each simulation started with a full external mixture of twoparticle types: pure black carbon, representing fresh combustion emissions, andhygroscopic background aerosol comprised of ammonium sulfate. As thesimulations proceeded, we computed cloud condensation nuclei concentrations andaerosol absorption for the same particle population, but with differentrepresentations of the aerosol mixing state. The size distribution and bulkaerosol composition was the same for all treatments, and they differed only inthe assumed distribution in chemical species between individual particles.

The internal mixture approximation,the simplest mixing state representation, was suitable for modeling cloudcondensation nuclei activity of aged aerosol, and under many atmosphericconditions, particles become internally mixed with respect to their hygroscopicproperties after only an hour of aging. On the other hand, average error inabsorption from internal mixture approximations ranged from 20-25%, butabsorption could be modeled with high accuracy if we modeled different particletypes as with separate classes and assumed internal mixing within each class.

P3.22 - ESTIMATING CLOUD DROPLET EFFECTIVE RADII THROUGH THE GLORY EFFECT USING A CONVENTIONAL RGB CÂMERA

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Using an RGB camera in an airplane we flew overthe Amazon Basin and observed the Glory Effect occurring on the topof clouds with nearly monosized cloud droplets. Through the analysis of the scattered solar radiation the clouddroplet effective radius was inferred.Simulating the Glory Effectwith the online software package IRIS, considering only the red color(630±50nm), we obtained a relation between the droplet radii and the rainbowaperture angle. With a calibration of our RGB camera, which relatesthe pixel of the image with the solid angle viewed by the instrument,we were able to derive a relation that immediately converts thedistance, in pixels, from the center of the Glory to the first redring in the picture, to the droplet radii simulated by the software.For instance, in one of this pictures, we estimated a 12µmdroplet radius for a homogeneous cloud. This result is consistentwith other results found in the literature for this kind ofconditions.Analyzing, in the same region, the droplet radii formany clouds in different heights, and comparing them with theirtemperature measured by a thermal camera, our goal is to build atypical thermodynamic profile of clouds in the region and comparethis information with other published results.

P3.23 - HYGROSCOPIC BEHAVIOR OF AEROSOLS OVER SAO PAULO METROPOLITAN AREA

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Keywords: Raman LIDAR, Water Vapor, hygroscopic growth.

The determination of the water vapor content in the atmosphere using LIDAR systems is being demonstrated to be very useful, as LIDARs can operate continuously.The Raman LIDAR has the ability of determining the water vapor mixing ratio (WVMR) using the ratio between the signal backscattered by water molecules and nitrogen molecules in the atmosphere, and this information can be used to derive the relative humidity (RH) profile using temperature from other co-located instruments or models. In conditions in which a large increase of the RH in a well-mixed atmosphere is verified, the changes in aerosol properties are due to the water uptake and the hygroscopic behavior of the aerosol population can be derived. The Raman LIDAR presents many advantages in this study, because the laser can operate in conditions of relative humidity next to saturation and under unperturbed atmosphere conditions.

In São Paulo, the IPEN LIDAR Group is running a Raman LIDAR with three channels since January 2012: 355 nm and the corresponding Raman wavelengths 387nm (nitrogen)and 408nm (water vapour), providing information of the water vapor mixing ratio.The values obtained are calibrated using independent calibration, such as a lampand co-located radiosoundings.

In this work, we present a case study of determination of the hygroscopic growth factor (f(RH)) of aerosols over São Paulo in September 2012 , using a well-known methodology from literature. The Lidar was used to derive the RH and the result were compared with

the radiosounding, showing good agreement. The f(RH)also showed good agreement with data found in literature for the same type of aerosol. We include a discussion of the limitations and future applications of this methodology.

P3.24 - NEW PARTICLE FORMATION IN AMAZON: CLOUDS, RAIN AND IONS

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New aerosol particle formation in tropics, including Amazonia, have been in focus for several decades. Observations indicate absence of large scale regional nucleation events known mainly from mid-latitudes. Currently it is accepted that aerosol particles in tropics are formed at high altitudes in upper troposphere predominantly in outflow from deep convective clouds. Then they consequently grow by condensation and coagulation into Aitken mode aerosol. By large scale subsidence they are transported downwards and entrained into boundary layer. Here we present new possible mechanism of new particle formation associated with convective clouds and rain. We have analyzed measurements of ultra-fine particle size distributions together with air ions in the Amazon rainforest environment. Almost every convective precipitation event is associated with strong production of atmospheric ions of few nanometer in size. Intensity of ion production is proportional to precipitation intensity. We combined aerosol size distributions observed by Scanning Mobility Particle Sizer (SMPS) and ion measurements from Neutral cluster and Air Ion Spectrometer (NAIS). Process based aerosol dynamics model CALM was used to simulate evolution of newly formed ions. Observed ion concentrations reached more than 100 000 cm-3, which corresponds to production rate around 100 cm-3 s-1. These ions with mean size around 4 nm within few hours decrease rapidly in concentration and through self-coagulation and consecutive growth form around1000 particles per cubic centimeter of mean size around 20 nm. Aerosol size distribution measurements from Amazonia show erratic occurrence of short bursts of new aerosol with mean size around 20 nm. Using year-long observations we show that frequency occurrence of these bursts is closely linked to diurnal cycle of convective precipitation over rainforest. Thus we propose hypothesis that convective clouds and rain are at the same time sink for aerosol particles due to wet removal and also source of new particles through rain driven ion induced nucleation.

P3.25 - WHAT IS THE PRIMARY CAUSE OF THE OBSERVED WIDESPREAD INCREASES IN PRECIPITATION INTENSITY?

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Significant increases in precipitation intensity, as a result of increases of heavy precipitation and/or decreases of light precipitation have been observed over widespread regions of the globe. Global warming and effects of anthropogenic aerosols have been proposed as possible causes of these changes. In this work we identify the primary cause of the increases in precipitation intensity by contrasting observed characteristics of precipitation in the tropical 10oS-10oN oceanic region to those at higher latitudes (5oN-20oN, 20oN-45oN land area) in the Northern Hemisphere (NH) for 1979-2007, and a polluted region in eastern China (1955-2011). Significant increases in heavy precipitation and/or decreases in light precipitation with net increases in precipitation intensity are found in all regions examined, while amounts of total precipitation show relative small or negligible changes. Characteristics of these changes suggest that global warming rather than aerosol effects is the primary cause of the changes. Increases of heavy precipitation and decreases of light precipitation can contribute to higher risk of floods and droughts, respectively. Quantitatively, we find, for one degree Kelvin increase in the 30oS-30oN temperature, a large increase of (188±34)% in the annual top 10% heavy precipitation in the tropical 10oS-10oN oceanic region; an increase of (123±60)% in annual top 10% heavy precipitation, a decrease of (22.5±11.5)% in annual bottom 40% light precipitation in 5oN-20oN zone; and in eastern China an increase of (57.7±33)% in annual top 10% heavy precipitation, a decrease of (28.6±11.6)% in annual bottom 10% light precipitation, an increase of (29.7±15)% in the annual occurrence of >=10 consecutive dry days, and a severe increase of (221.6±68.7)% in the annual occurrence of PDSI <= -3.

P3.26 - ACONVEX: A NEW SITE IN CENTRAL AMAZONIA DEDICATED TO LONG-TERM CLOUD PROPERTIES OBSERVATIONS – DESCRIPTION, FIRST RESULTS AND FUTURE PERSPECTIVES.

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The Amazon basin, especially during the wet season, has been pointed out as one of the few places on Earth where the “natural atmosphere”, as it is expected to have been in pre-industrial era, can be observed. Atmospheric properties in an unpolluted Amazonia can be regarded as a baseline state for the tropical atmosphere. Deep convection and the resulting hydrological cycle are extremely active. Several scientific questions with respect to deep convection remain unclear. The diurnal cycle of convection is far from adequately represented in numerical models. Precipitation typically occurs in models in the first few hours in the morning, whereas observed rainfall takes place mostly in mid-to -late afternoon. Convective parameterizations lack the ability to properly represent deep convective due to the coarse resolution of models compared to the scale of phenomena that drive local convection. An adequate comprehension of the shallow-to-deep convection transition is critical to improve convection representation in models. To reach this goal, long term measurements that characterize clouds and convection are fundamental. The implementation of an ACONVEX (Atmospheric CONVection EXperiment) site, situated 50 km upwind from the megacity of Manaus, aims to fill the existent gap in long term measurements. It is designed to make measurements for longer than 10 yrs, and to characterize cloud properties from a climatological perspective. The site began operation in August, 2011. The array of instruments comprises: 1) UV Lidar Raman, 2) CIMEL Sunphotometer, 3) MultiFilter shadow band Radiometer (MFR), 4) GNSS/GPS Receiver, 5) Vertical Pointing Radar, 6) Disdrometer, 7) Ceilometer, 8) surface meteorological station. Two sky imagers and a microwave radiometer will be installed soon. Parameters to be derived are: 1) Cloud Cover, 2) Cloud Top and Cloud Base Heights, 3) Liquid Water Content, 4) Integrated Precipitable Water, 5) PBL Height, 6) Rain Rate (vertical profile and at surface). In this presentation we will discuss the site in detail, as well as recent results and future perspectives.

P3.27 - INVESTIGATION OF TRACE GAS TO AEROSOL RELATIONSHIPS OVER BIOMASS BURNING REGIONS USING DAILY SATELLITE OBSERVATIONS

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The quantification and characterization of aerosols fromspace is a great challenge. Especially in the presence of clouds and over landsurfaces, it is often difficult to distinguish the signals of aerosolscattering from scattering by cloud particles or surface reflection.

Instead of deriving aerosol properties directly, satelliteobservations of tropospheric trace gases, emitted by the same emission sourcesas the aerosols, can be used to derive additional information on the aerosols.Such observations have two potential advantages: First, from the composition oftrace gases, information on the aerosol type can be derived. Second, suchobservations are possible in the presence of clouds (although usually withreduced sensitivity if the trace gases are located below the cloud).

In this feasibility study we investigate the relationshipbetween satellite observations of trace gases (CO, NO2, HCHO,CHOCHO) and AOD (measured from satellite or ground). We also include in ourcomparison satellite observations of the so called UV aerosol index (UVAI),which is an indicator of the aerosol absorption. Like the trace gasobservations, also the UVAI can be retrieved in the presence of clouds.

We investigate aerosol-trace gasrelationships over biomass burning regions. Depending on their opticalproperties and altitude distribution such aerosols can have a strong impact onthe atmospheric energy budget through direct and indirect effects. We performcorrelation analyses for selected AERONET stations and also for larger biomassburning areas by also taking into account satellite observations of firecounts.

P3.28 - INFLUENCE OF WEATHER ON THE CONCENTRATION OF RADON GAS IN AN AREA OF DEGRADED CAATINGA IN RIO GRANDE DO NORTE, BRAZIL

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Radon (Rn) is a radioactive noble - dense ,colorless, odorless , tasteless gas and highly soluble in water. Radon, amongall naturally occurring radioactive elements in the atmosphere, has beenextensively studied and some of that interest was due to its monitoring acrossthe period 1950 to 1980, where it was listed as a health risk in homes andunderground workplaces. Specifically, in biomes of Northeast Brazil (NEB),little is known about the behavior of radon with regard to its influence on theformation of atmospheric aerosols through evapotranspiration of plants Thepresent study aimed at investigating the relationship between meteorologicalvariables and the concentrations of radon in the atmosphere of the Caatinga, aunique savanna-like biome in the stateof Rio Grande do Norte The experiment was conducted on the premises of theheadquarters of Agricultural Research of Rio Grande do Norte (EMPARN) in themunicipality of Apodi , located at latitude 5 º 37 ‘ 37.5 “ South andlongitude 37 ° 49’ 0.3 “ West in the period between 15 and 19 November2013. We set up a tower about 6 feet tall. We installed two meteorological stations,the first at 1.5 m and the second at 5.0 m from the soil. We measured the airtemperature, relative humidity, wind speed and direction and atmosphericpressure. From the meteorological variables we calculated the Bulk Richardsonnumber (Rib) for verification and classification of static stability of theatmosphere. Concentration measurements of Rn were performed by and Alphaguardinstrument, model PQ 2000 PRO at 1 m height.The daily cycle of Rn concentration presented a bimodal pattern, with a mainmaximum of 27.8 Bq/m3h around 05:00 a.m. and a secondary maximum of14.6 Bq/m3h around 07:00 p.m.. This cycle is consistent with timeswhen the atmosphere is statically neutral due to the transition periods ofstable to unstable regimes (first peak) and unstable to stable regimes (secondpeak) according to the Rib. These results are novel for the Caatinga biome.

Keywords:Alphaguard, the Richardson number, static stability

P3.29 - CHEMICAL AND PHYSICOCHEMICAL PROPERTIES OF RAINWATER ON THE ISLAND OF SANTA CATARINA: POSSIBLE ROLE OF SULPHATE ON ENHANCED OF WARM CLOUD PRECIPITATION

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The state of Santa Catarina, Brazil, is known for the high number of natural disasters associated with heavy rainfall. Much of this rain are associated with the precipitation of warm cloud called “Lestada” by the local inhabitants. Such phenomena do not have a

good prediction by numerical models since the clouds are low to high rainfall produced by them. This study aims to find a role of oceanic aerosols on this process. To achieve this aims we make a monitoring of chemical and physicochemical properties of rainwater. Rainwater samplings were collected in the city of "Florianópolis" (27°59'93"S, 48°51'93" W) (421,240 inhabitants) in the state of Santa Catarina using rain samplers designed by the "Laboratório de Controle da Qualidade do Ar (LCQAr) of the Universidade Federal de Santa Catarina" (UFSC) within a superficial area of 1 m^2 (1 m x 1 m). Prior to being used, all the polyethylene sample bottles were soaked in Millipore water for at least 24 h, as described by Martins [1] and Wang et al. [2]. The rainwater samplers were placed 1.5 m from the ground, unobstructed by obstacles such as buildings or trees. The rain samplers has previous cleaned using distilled water to ensure that the rainwater have no contamination before getting into the container. In-situ measurements of pH and conductivity were taken using a pH meter (Lutron-206, precision ± 0.02 pH) and an electric conductivimeter (Lutron CD 4322E, precision ± 2%), respectively. Anions were determined by ion-chromatography (Dionex model DX-120). All samples were preserved at 4°C before laboratory analysis. A total of 19 samples were collected between August 2012 and June 2013. The investigated receptor was situated in the coastal belt of a region of the Atlantic which has great continental and marine influences. Only one "Lestada" happen in this period (form 14 until 20h March 2013). The partial results show high concentration of Sulphate for all rainfall collected from December 2012 to June 2013. All others anions analysed (chloride, nitrate and phosphate) has been relatively low concentration except two events where a high concentration of chloride has been found. These events have also showed the higher conductivity.

P3.30 - A 3-DIMENSIONAL GLOBAL MODELING STUDY OF THE INFLUENCE OF MULTIPHASE PROCESSES ON THE OXIDATIVE CAPACITY OF THE TROPOSPHERE

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Oxidants, in particular hydroxyl radical (OH), are central to the self-cleaning capacityof the troposphere. They control the formation of secondary gaseous and particulate pollutants, the removal rates of most trace gases and chemical ageing of aerosols. Oxidants are present in all phases of the atmosphere. While key tropospheric oxidants are formed mainly in the gas phase, recently, attention has been paid to the multiphase reactions in the atmosphere as a source ofoxidants and organic aerosols.

Rapid multiphase redox processes in the aqueous-phase, involve key tropospheric oxidants, like OH and hydroperoxy (HO2) radicals. The particularly high HO2 solubility in water leads to a strong uptake of HO2 by wet aerosols and due to the low aerosol water pH, to subsequent formation of superoxideanion (O2-), a strong oxidation agent. The main atmospheric reservoirs of liquid water in the troposphere are cloud droplets and wet aerosols. Components of crustal and combustion aerosols, like Fe and Cu, significantly affect the OH/HO2 aqueous-phase cycle. Fenton reactions involving Fe2+/Fe3+ and Cu+/Cu2+ transformations impact on the OH/HO2 cycling via HO2 conversion to hydrogen peroxide and water, with significant changes in OH concentrations. These reactions tie together oxidants/aqueous phase chemistry and aerosol elements from natural sources (dust) and combustion.

The impact of this chemical interplay between the phases and types of sources inthe atmosphere on oxidants levels, and subsequently on greenhouse gases lifetimes and on aerosol properties is evaluated in the present study on global scale. A global 3D chemistry transport model (CTM) able to simulate O3 and non-methane volatile organic compounds chemistry together with all major inorganic and organic aerosol components, primary and secondary is used. For this study, a detailed multiphase chemical scheme in both cloud and particulate water is on-line coupled to the model. Dust mineralogy has been taken into account to calculate the associated element emissions. Model results are compared with observationsand the potential global implications of these reactions for oxidants andaerosol properties are presented and thoroughly discussed.

P3.31 - PERFORMANCE AIR COLLECTORS M T, MILLIPORE ® ECO 100 E, MERCK® COLLECTIONS EXTERNAL IN ATMOSPHERIC AIR

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Concernabout the quality of atmospheric air gradually increases because theircomposition may influence the health of people . Different studies of indoorair have brought government standards of micro- organisms and chemical residues, while the values ??for the concentration of micro - organisms in the air outside still lackstandardization , making it necessary research that contributes to the study ofquality of outside air . The choice of methodology and best equipment tocollect air samples that should be assessed against that already exist in themarket . Some studies claim that particulates , aerosols , vapors , gases andother factors contribute to pollution and excessive micro -organisms . Heavilypopulated areas such as the city of São Paulo demand greater control of airquality and the concentration of micro -organisms such as fungi , they areresponsible for triggering allergic respiratory manifestations , especially inchildren and the elderly . The aim of this study is to report the frequency offungi in atmospheric air for a period of four months , comparing theperformance of two air collectors M T air , Eco 100 , as the ability to collectand quantify the colony forming units (CFU) of fungal species isolated . Thecollections were made at two different locations , these being the Intituto ofAstronomy and Geophysics , University of São Paulo (IAG - USP) and theInstitute of Cancer of São Paulo , getting 250L of air through each of the twodevices . The culture medium was placed in its cassette DRBCm . The incubationwas 7 days at 30 ° C. The CFU counts and the IDs of genres were performedaccording to De Hoog , 2000. 45 samples of atmospheric air totaling 90 fungalisolates were collected . The CFU counts reached s = 32.91 . Statisticalanalysis was performed using the Mann- Whitney test was 0.4481 , showing nosignificant difference . We conclude with a confidence level of 95 % , there isno evidence that the efficacy of detection of fungi is different when comparingthe two devices.

P3.33 - FOG SCAVENGING AND PROCESSING: EFFECTS ON CLIMATE RELEVANT AEROSOL PROPERTIES

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The interaction of atmospheric water with aerosol modifies particle properties which are relevant for climate, including particle concentration, size distribution, chemical composition, mixing state, and particle hygroscopicity.

Aerosol - fog interaction and its effect on submicron aerosol climate relevant properties were investigated in the Po Valley (northern Italy) during fall 2011. The experiment was performed in the framework of the Supersite project (ARPA Emilia Romagna). Composition and physical properties of submicron aerosol were measured online by a High Resolution- Time of Flight – Aerosol Mass Spectrometer (HR-TOF-AMS) and a Soot Photometer – Aerosol Mass Spectrometer (SP-AMS). Organic functional group analysis was performed off-line by Hydrogen - Nuclear Magnetic Resonance (H-NMR) spectrometry and Fourier Transform Infrared (FTIR) spectrometry. Aerosol absorption, scattering, and total extinction were measured simultaneously with a Particle Soot Absoprtion Photometer (PSAP), a Nephelometer, and a Cavity Attenuated Phase Shift Spectrometer particle extinction monitor (CAPS PMex), respectively. Particle hygroscopicity was measured by a Hygroscopic Tandem Differential Mobility Analyzer (HTDMA).

During the experiment 14 distinct fog events were observed. Fog scavenging removed preferentially water soluble components, i.e. ammonium sulfate and nitrate, leaving an interstitial aerosol enriched in carbonaceous species, mainly water insoluble organic aerosol (OA) and black carbon. Scavenging efficiency of nitrate, on average 0.7, was close to unity in particles larger than 700 nm Dva (vacuum aerodynamic diameter). Larger variability was observed in smaller particle (Dva below 300 nm) where 44-51% of the nitrate scavenging variability was explained by changes in particle chemical composition. OA scavenging efficiency (0.5 on average) was controlled by its polarity, functional group composition, and mixing with inorganic water soluble species.

Single scattering albedo (SSA) was strongly affected by fog, due to the efficient removal of scattering aerosol components. SSA at 573 nm showed maxima outside fog (0.9) and minima during fog events (0.7).

Time trend of growth factor derived kappa was controlled by fog as well. Kappa values of 80 and 100 nm particles were higher outside fog and decreased when fog appeared, due to the efficient scavenging of hydrophilic aerosol components and the enrichment in OA.

SESSION 4: ATMOSPHERIC CHEMISTRY AND URBANIZATION: FROM LOCAL TO THE GLOBAL SCALES

P4.1 - HOURLY VARIABILITY OF AMMONIA IN A STREET WITH HEAVY TRAFFIC

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Ammonia (NH3) is the main chemical compound to neutralize atmospheric acidity and also a key precursor to secondary inorganic aerosol formation. Agricultural activities have been the main source of ammonia, from the NH3-based fertilizer applications and animal husbandry. The contribution of vehicles to non-agricultural emissions of NH3 was considered unimportant until 1995. However, due to the incorporation of technology of catalytic converters in vehicles running with petrol, the ammonia emission has become substantial. Vehicles equipped with catalytic converters generate ammonia through the process of nitrogen oxide (NO) reduction, which occurs when the ratio air:fuel combustion is less than the stoichiometric value. Latest estimates indicate an increase of more than 200 times in the vehicular emission contribution for nitrogen cycle in the form of ammonia. Therefore, considering that the vehicle fleet of São Paulo city equipped with three-way catalysts corresponds to 46% (vehicles from 1999 onwards) of the 7 million lightvehicles, it can be suggested that the presence of this technology hasincreased substantially the ammonia urban emissions. In the metropolitan areaof São Paulo (MASP) there are published data of ammonium ion for rainwater and particles material, but there are no results of ammonia (gas phase). This study has, as its main objective, to evaluate the hourly variability of ammonia concentrations in a street with heavy traffic in MASP, during Summer 2013, from November 9 to December 17. The PicarroG2103 monitor, a sophisticated measurement system that uses a laser to quantify the spectral characteristics of molecules in the gas phase into an optical cavity, was used for NH3 and H2O analysis. The hourly variability of NH3 concentrations showed relation with the traffic,presenting maximum values between 8 to 10 a.m and 6 to 8 p.m. In the monitoring period,we observed lower NH3 concentrations on weekends, mainly on Sundays dueto two lines available only for bicycles. The ammonia hourly average values were 11 ppb (8 mg m-3) reaching maximum values of 26 ppb (18 mg m-3).These concentrations were higher than those in the agricultural areas, and similar to those observed in urban areas of Europe and USA.

P4.2 - COMPARISON OF PM2.5 AND PM2.5-10 CHEMICAL COMPOSITION FROM IAG/USP (WEST REGION) AND EACH/USP (EAST REGION) IN SAO PAULO CITY

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The inhalable particulate matter (PM10)is composed of PM2.5 plus PM2.5-10. Being a serious problem of air pollution inthe metropolitan area of Sao Paulo (MASP, it has been evaluated by an important air quality monitoring net (CETESB), measuring its PM10 and PM2.5mass concentrations, but not its chemical composition. The present work shows results of the chemical composition (trace elements and ions) of PM2.5(fine PM) and PM2.5-10 (coarse PM) for two regions: east (EACH/USP)and west zones (IAG/USP), during Winter and Spring of 2012. Despite the fact that both sites are inside the university campus, the west zone USP campus is agreen-park (7.4 km2) surrounded by important avenues with intense traffic of light- and heavy-duty vehicles. On the other hand, the EACH/USPcampus is a lower area with more exposed soil and is very close to the intense heavy-duty traffic highway, besides being surrounded by industries. The west-

ern region presented higher PM2.5(21.09±14.04 mg/m3) average mass concentration than PM2.5-10(16.19±8.17 mg/m3). On the contrary, in the east PM2.5-10(27.30±25.55 mg/m3) was higher than PM2.5 (19.41±9.63 mg/m3). Despite the difference in the NH4+and SO42- mass concentrations for the two regions, both presented similar relation between these ions. Considering molar concentrations, R2 were 0.9 for both, being the angular coefficient 1.8 and 1.5 for west and east PM2.5, respectively. These relations were not observed for PM2.5-10, indicating the importance of the NH3 and H2SO4 reactions for secondary inorganic aerosol formation. Another important result for PM2.5 was the relation between the sulfur (S) and the phosphorous (P), which in both regions presented R2 > 0.9 and the angular coefficient around 26, being the S average concentrations 1274 and 1053 ng/m3 in the east and west regions, respectively. This angular coefficient was higher than that observedin tunnels experiments (2011) which presented higher P concentrations and similar S contents in PM2.5. These results could be explained by thepresence of vehicular emissions of this trace element in both studied regions, in spite of the atmospheric dilution of phosphorous, comparing with tunnels.

P4.3 - AIR QUALITY IMPLICATIONS OF BACKYARD BURNING IN URBAN AREAS

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Smoke from burning of household trash by residents on their own backyards is a major contributor to air pollution in urban areas. Fire foci are frequently observed in Londrina (a mid-sized city in southern Brazil) where, in addition to backyard burning, agricultural burning is also carried out to clear the land for planting and control weeds. During the dry season, the pollutants from the burning of domestic waste accumulate in the atmosphere deteriorating air quality. One of the most harmful by-products of the smoke is black carbon (BC) particles, which impact both climate and health. In this study, we conducted continuous BC measurements using a 7-wavelengthaethelometer during August and September 2013 at a suburban site in Londrina. The results indicate that the BC concentrations show a faint mean diurnal cycle and are little affected by human activities usually found in nearby urban areas, such as vehicular traffic. In spite of that, in many occasions BC concentrations reached values as high as 50 ug/m3. Except for an outbreak of long-range transport of pollutants from biomass burning in the Amazon/Cerrado regions, which resulted in large BC concentrations during five contiguous days, the greatest BC concentrations were observed from 5 pm to 9 pm, coinciding with the time of the day when residents return home and engage in household chores. This local signal is clearly discernible at all wavelengths, however the BC concentration in the ultraviolet (370 nm) is larger (up to 50 ug/m3) than the concentration in the infrared (950 nm) (up to 30 ug/m3). Organic compounds in wood smoke aerosols result in a strong UV absorption whilst traffic-dominated aerosols have a stronger absorption in the IR. This study shows that, contrary to previously thought, urban areas may be subject to high air pollution levels due to sporadic burning off of branches, leaves, twigs and other domestic yard debris such as paper, food scraps and plastics.

P4.4 - SOURCES, SEASONAL VARIABILITY AND OXIDATION STATE OF ORGANIC AEROSOL IN THE EASTERN MEDITERRANEAN

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Thesources, seasonal variability and oxidation state of organic aerosol werestudied at the remote background site of Finokalia, Crete (EasternMediterranean) for a period of 16 months (June 2012 to December 2013). Thestudy is based on measurements performed using an Aerosol Chemical SpeciationMonitor (ACSM) and the resulting organic components identified by PositiveMatrix Factorization (PMF) analysis of the organic mass spectra. Differentfactors and subsequently different sources are identified depending on theseason, each factor having varying contribution to the total organic aerosol(OA). Overall the O/C ratio of the total OA varies between 0.61 and 1.31, witha mean value of 1.06±0.13, which is within the observed values oflow-volatility oxygenated organic aerosol (OOA) and dicarboxylic acids. Thisratio can be a proxy for the oxidation state and its variability can reflectthe variations in OA age during the measurement period. Based on PMF analysis,throughout the study period the factor that exhibits the largest contributionis a highly oxygenated OA with pronounced relative intensity of m/z 18 and 44,which is furthermore supported by its elevated O/C (1.25±0.07). It exhibits aseasonal cycle with minimum average concentrations during winter (1.07±0.82 μg m-3) andmaximum during summer (2.13±1.07 μgm-3) and respective contribution of 52% and 58%. Long-rangetransport of biomass burning from Southeastern Europe and countries surroundingthe Black Sea influence the site during two periods (April-May andJuly-September). The fresh BBOA factor during these periods is estimated tocontribute on average 17.1±2.2% to the total OA. Finally, a distinct regionalsource of olive tree branches burning, which is a common agricultural wastemanagement practice in the Mediterranean area after the annual pruning of olivetrees, is also identified from November to February (not included in theaforementioned BBOA). This factor can contribute up to 48% of the identified OAduring wintertime and can be regarded as an important emission source duringthis season in the region.

P4.5 - ATMOSPHERIC AEROSOL AT THE COAST OF NORTHEASTERN BRAZIL

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Esta pesquisa tem o objetivo de analisar e grupo de capitais do Estado localizados na costa do Nordeste do Brasil (NEB), em relação à sua variabilidade intra-anual de carga de aerossóis atmosféricos, representado pelo valor de Aerosol profundidade óptica (AOD). A metodologia utilizada dados diários de AOD em um comprimento de onda de 550 nm para o período de 2001-2013, obtido a partir do sensor Moderate Resolution Imaging Spectroradiometer (MODIS) na Terra ea plataforma Aqua. O método de análise consistiu em um estudo descritivo e aplicação da análise de cluster. A análise de cluster é uma forma multivariada de análise em que uma técnica para a construção de grupos de clusters juntos medidas semelhantes (métricas) de distância e determina uma conexão entre os clusters. Neste estudo, a medida de similaridade aplicado consiste na distância Minkowski e método de ligação de Ward, considerando AOD (adimensional), velocidade do vento (ms - 1) e direção (°) das capitais do estado de NEB como variáveis. Os resultados mostraram que há uma predominância do tipo aerossol marinho na costa leste por causa de ventos de leste e sudeste da Intertropical Zona de Convergência (ZCIT) . análise de agrupamento delineou quatro grupos, o primeiro composto por as cidades de Natal, João Pessoa e Recife , o segundo pelas cidades de Salvador, Maceió e Aracaju e separadamente as cidades de Fortaleza e São Luis. AOD A máxima no primeiro grupo ocorreu em setembro (0,25 ± 0,01), devido à intensificação dos ventos (ondas de leste). No segundo grupo, os aerossóis foram mais intensas em setembro e outubro (0,26 ± 0,02 e 0,23 ± 0,02) em função do vento do leste e sudeste (sistemas frontais, ondas altas do sul semi-permanentes do Atlântico leste). Em Fortaleza a maior intensidade de ventos de leste em setembro não define o mais alto nível de AOD que ocorre entre fevereiro e abril (0,22 ± 0,01). São Luís tem uma magnitude muito diferente de (0,30 ± 0,04) em comparação com outras cidades, devido à sua localização geográfica (A cidade está localizada na Ilha de São Luís na Baía de São Marcos). O máximo AOD anual ocorreu em fevereiro (0,36 ± 0,02), com ventos vindo do ZCIT e direção nordeste.

P4.6 - FIRST TIME EXPLORATORY STUDY OF WATER-SOLUBLE ORGANIC CARBON RELATIONSHIPS WITH METALS AND METEOROLOGICAL CONDITIONS IN THE RIO DE JANEIRO"S ATMOSPHERE

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It is a common sense that the atmosphere in the state of Rio de Janeiro has been changing. Pollutants are thrown daily into it. Despite knowing that, the amount had not been quantified yet and its effects had not been studied. The aim of this study is to better understand what effects they have in our atmosphere as well as quantifying the water-soluble organic carbon (WSOC) and the metals. During the period between January/2011 to December/2011, fine particulate matter (PM2.5) were collected at 15 different sites of the Metropolitan Region of Rio de Janeiro (MRRJ), in order to investigate relationship among WSOC, metals and meteorological conditions in the air quality. Acid extracts of PM2.5 were prepared to determine 15 metals by Inductively Coupled Plasma Optical Emission Spectrometry (ICP OES); and aqueous extracts to determine WSOC by TOC analyzer. All the data was compiled using the Principal Component Analysis (PCA). Results showed that the PM2.5 annual average in the MRRJ was about 15 μg m-3, exceeding the WHO guideline (10 μg m-3). Daily levels as high as 61 μg m-3 were measured in some sites. WSOC ranged from 0.01 to 42.59 μg m-3. The main metals determined were Al (0.15 to 13.06 μg m-3), Cu (0.01 to 0.17 μg m-3), Fe (0.01 to 0.97 μg m-3), Ti (0.01 to 0.50 μg m-3) and Zn (0.05 to 14.23 μg m-3). Principal components analysis was applied in dataset containing WSOC, metals and meteorological conditions (i.e., wind speed, wind direction, relative humidity, temperature and solar radiation). Interestingly, PCA showed that the chemicals compounds present in the air added to the meteorological phenomena explain about 80% of the characteristics of the atmosphere in the state of Rio de Janeiro and only the chemical compounds explain 50%. For the event more data will be added to the poster and further information will be given. Acknowledgements. FAPERJ, CNPq, Inea

P4.7 - DETERMINATION OF HYDROGEN SULFIDE (H2S) NEARBY A WASTEWATER TREATMENT PLANT (WWTP)

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Wastewater treatment plants using anaerobic systems, when located in heavilypopulated areas, create a territory conflict scenario mainly due the strongodors emitted by the treatment.

The main contribution for the unpleasantsmell is H2S, a colorless, flammable gas with a rotten egg characteristicaroma and detectable to human even at low concentrations (0.7 µg.m-3).

According to United States Environmental Protection Agency, thereference concentration for inhalation exposure to H2S is 2 µg.m-3 in ambient air, above which adverse effects on humanhealth are observed. World Health Organization (WHO) defines that concentrationsfrom 10 to 30 µg.m-3 in air can cause eyes and respiratory system irritationand headache, in a long-term exposure. In addition to health problems, whichmay affect mainly children, elderly and people with special needs, property depreciationin the proximity of WWTP is a significant problem.

H2S concentrations were evaluated in 15 sampling pointsduring two weeks. Sampling occurred once during winter season (6 – 27 of August,2013) and twice during summer season (5 – 14 of December, 2013 and 5 – 20, of February,2014) at Curitiba, Paraná, Brazil. The gaseous collection was performed withpassive air samplers and subsequently analyzed by Spectrophotometry.

For the first campaign (winter), average concentrations ranged from 0.14to 28 µg.m-3, with higher values ??corresponding to sampling pointsnear the WWTP. The average temperature was 15 ºC. Such concentrations arehigher than those detected in a field of oil extraction in Bahia, Brazil andsimilar to those found at big cities in Greece, Japan and USA. At mostconcentrated points, levels are about to extrapolate WHO's recommendations toavoid the lighter human symptoms.

For the results of the summer campaigns, we expect higher concentrationsdue the increase of temperature, which elevate bacterial activity in thedegradation of organic matter, generating stronger odors and raisingconsequently the risk to human health.

This research canoffer, therefore, new insights to mediate the conflict involving the populationwho live in the immediacy of WWTP, supporting the development of new policiesfor urban planning.

P4.8 - ATMOSPHERIC AEROSOLS IN THE AMAZON: THE CHANGING ELEMENTAL COMPOSITION IN AREAS WITH DIFFERENT LAND USES.

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Elementalcomposition of atmospheric aerosols in the Amazon has been investigated inrecent years due to its impact on biogeochemical cycles and to help on thesource apportionment of primary biogenic and SOA. Under natural conditions, from January toMarch (wet season), the aerosol of Amazon is characterized by biogenic sources,-soil dust and sea salt particles. From August to October (dry season), biomassburning emissions from the Southwestern part of the basin changes theatmospheric composition. This work aims to investigate the processes and/orsources controlling the inorganic component of aerosol particles in theatmosphere of the central Amazon region. Aerosols were collected on Nucleporepolycarbonate filters in the biological reserve of Cuieiras – Manaus/AM(February 2008 to July 2012) and Porto Velho/RO (September 2009 to October 2012)and subjected to gravimetric analysis for the PM10 and PM2.5 components. Energydispersive X-ray fluorescence was applied, for the analysis of trace elements.The equivalent black carbon (EBC) was analyzed by optical reflectance. Absoluteprincipal factors analysis and positive matrix factorization was used to quantifythe contribution of the different sources of aerosols. The results shown theaverage concentrations in Porto Velho in the fine mode were 37 ± 37 μg m-3(dry season) and 1.7 ± 1.0 μg m-3 (wet season). In the coarse modewere 11 ± 9 μg m-3 (dry season) and 7 ± 4 μg m-3 (wetseason). In Manaus the fine mode was 7 ± 4 μg m-3 (dry season) and2.5 ± 1.4 μg m-3 (wet season) and coarse mode were 11 ± 9 μg m-3(dry season) and 7 ± 4 μg m-3 (wet season). It was observed that theprimary biogenic emissions can be characterized by P, S, K and Zn. Biomassburning contributes to K, S, Ca and EBC. The transport of dust from the SaharaDesert is identified during the rainy season in Manaus, with highconcentrations for Al, Si, Ca, Fe and Mn. It is possible to observe that EBChas a significant contribution from natural biogenic aerosols for both fine andcoarse modes.

P4.9 - CARBONACEOUS AEROSOL IN AMAZON: ORGANIC AND ELEMENTAL CARBON IN AREAS WITH DIFFERENT LAND USES.

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Carbonaceous aerosols dominates the aerosol mass in backgroundcontinental areas. These are separated in an organic carbonaceous component(OC) and the elemental carbon component (EC). EC is generated by incomplete combustionof organic materials that together with the so-called “brown carbon” componentis responsible for an important absorption factor in the atmosphere. EC and OCare measured by thermo-optical methods, while EBC refers to optical absorption propertiesand is measured by optical reflectance or transmittance methods. Undernatural conditions, the aerosol over Amazonia is characterized by primary andsecondary biogenic sources, soil dust and marine spray. In the dry season, whenfires occur in the arc of deforestation, biomass burning is also an importantcomponent. In this paper we investigate the processes and/or sources governingthe organic component of aerosol particles in the central Amazon. Aerosols sampleswere collected on Pallflex quartz filters in biological reserve Cuieiras –Manaus/AM (February 2008 to July 2012) and Porto Velho/RO (September 2009 toOctober 2012). The thermal-optical method was applied with the Sunset OCECanalyzer, providing organic and elemental carbon concentrations. EBC wasanalyzed by reflectance and total aerosol mass by gravimetric techniques. Tostudy the variability of elemental concentrations, absolute principal factorand positive matrix factorization analysis was used to quantify the sources ofaerosols in Amazonia. The average concentrations of OC (PM10) in Porto Velho were 11 ± 5 μg m-3 (dry season) and 6 ± 2 μg m-3 (wet season). Theconcentration of EC was 0.9 ± 0.5 μg m-3 (dry season) and 0.5 ± 0.3 μg m-3(wet season). The concentration of OC in Manaus was 6 ± 3 μg m-3 (dry season) and 1.7 ± 0.5 μg m-3(wet season), while the concentration of EC was 0.6 ± 0.3 μg m-3(dry season) and

0.14± 0.05μg m-3 (wet season). The major contribution of OC was duringthe dry season for both sites by the strong influence of biomass burningemissions.

P4.10 - HIGH RESOLUTION SIMULATIONS OF VERTICAL STRATIFICATION OF POLLUTANT OVER SANTIAGO, CHILE

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During a few days in late August 2013, a short,multi-platform measuring campaign (DIVERSOL) took place in Santiago, Chile(33.5 S, 70.5 W, 500 m.a.s.l.), providing the first vertical profiles of black carbon, accompanied by meteorological soundings and backscattering from a 355nm elastic LIDAR. To improve our understanding of the governing mixing and transport processes, we use a state of the art numerical model (WRF, Weather Research and Forecasting model) to simulate the fate of a quasi-passive tracer of black carbon. We perform sensitivity analysis with respect to vertical resolution and turbulence schemes, contrasting against DIVERSOL data. With this tool we also explore the mechanisms that enable the export of urban pollution out of Santiago. If the results of a second DIVERSOL campaign become available,we will report new results. Such a campaign is being planned for the upcoming winter season in Santiago.

P4.11 - IN VITRO ANALYSIS OF PARTICULATE OUTPUT FROM A DEMOLITION SITE, MANCHESTER

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Alarge array of literature underlines the growing concern for the impact ofparticulate matter from anthropological sources in urban settings onhuman health1, 2. Particles of specific interest are those whichgather as curb-side sediment poised to be pulverised and perturbed hencesuspended by the action of vehicles making use of the road, road dust (RD)3.During the winter months 2012-2013 a large building was demolished in thecentre of Manchester, the aim of this paper is to assess the changes inelemental composition of inhalable fractions of RD collected 20 metres from thedemolition site. The initial sampling takes place in November 2012approximately two weeks before demolition began, with the second samplingcampaign taking place in May 2013, during the final stages of demolition.Consistent methodology was observed, approximately 10 kilograms of RD wascollected using a clean polythene dust pan and brush. Samples were air driedand sieve fractioned, analysis took by ICP-OES following a microwave assistedHF digestion. Interestingly, results indicate that the heavy and trace metalswere generally lower in concentration for the second sampling campaign, afterdemolition had taken place. Two notable exception being the silicon andaluminium portions, which increased in concentration by 7.4% and 20%respectively for the smallest fraction (<38μm), 5.9% and 56.7% respectivelyfor the next sized fraction (63-38μm) and 8.6% and 3.8% respectively for thelarger fraction (125-63μm). In vitro experimentationcarried out on these road dusts using artificial lysosomal fluid indicates thatup to 30% of inhalable fraction of aluminium is bioaccessible.

1 Meister, K., Johansson, C., & Forsberg, B., 2012. Estimated short-termeffects of course particles on daily mortality in Stockholm, Sweden.Environmental Health Perspectives,

120, 431-436.

2 Sorenson, M., Hoffmann, B., Hvindberg, M., Ketzel, M.,Jensen, S. S., Andersen, Z. J., Tjonneland, A., Overvad, K., &Raaschou-Nielsen, O., 2012. Long-term exposure to traffic-related air pollutionassociated with blood pressure and self-reported hypertension in a Danishcohort. Environmental Health Perspectives, 120, 418-424.

3 Atiemo, S. M., Ofosu,G., Aboh, I. J. K., & Oppon, O. C., 2012. Levels and sources of heavy metalcontamination in road dust in selected major highways of Accra, Ghana. X-ray-Spectrometry, 41, 105-110.

P4.12 - RURAL INDIAN WOMEN CHRONICALLY EXPOSED TO BIOMASS SMOKE DURING DAILY HOUSEHOLD COOKING HAVE ALTERED IMMUNE DEFENSE

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Changes in cells of the immune system are important indicators of systemic response of the body to air pollution. The aim of this study was to investigate the immunological changes in rural women who have been cooking exclusively with biomass for the past 5 years or more and compare the findings with women cooking exclusively with liquefied petroleum gas (LPG). We conducted a cross-sectional analysis of the associations between indices of household air pollution (HAP) and a set of immune assays. Biomass users illustrated marked suppression in the total number of T-helper (CD4+) cells and B (CD19+) cells while appreciable rise was documented in the number of CD8+ T-cytotoxic cells and CD16+CD56+ natural killer (NK) cells. A consistent finding among biomass users was rise in regulatory T (Treg) cells. Among biomass users, peripheral lymphocyte subpopulations, Treg cells, and the number of typical monocytes (CD16-CD64+ cells), antigen presenting types (CD16+CD64- cells) and plasmacytoid cells (CD16-CD64- cells) were found to be significantly altered in those who daily cooked with dung in comparison to wood and crop residue users ($p<0.05$). Biomass users who cooked in kitchens adjacent to their living areas had significant changes in peripheral lymphocyte subpopulations, typical monocytes (CD16-CD64+) with high phagocytic activity and antigen presenting monocytes (CD16+CD64-) against women who cooked in separate kitchens ($p<0.01$). This study has shown that women who cooked exclusively with biomass fuel had alterations in immune defense compared with their neighbors who cooked with LPG.

P4.13 - INDOOR AIR QUALITY OF THE BRAZILIAN NATIONAL LIBRARY

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Although the study of indoor air quality in libraries is already recognized in Europe and USA, it is still unclear in developing countries, mainly under tropical and subtropical climates. Installed in 1910 at the central area of Rio de Janeiro city, the Brazilian National Library (BNL) has under its guard more than 9 million items comprising books, folders, manuscripts, engravings and maps. Included in the rare collection is the first edition of the Luís de Camões' epic work Os Lusíadas, published in 1584, and the Mazarin Bible of

1462, believed to be the second printed version of the Scripture and consequently considered to be among the most valuable books in the world. Preventive conservation is therefore the principal aim of this research. In order to access the indoor air quality of the BNL, the gaseous pollutants NOx, SO2, O3, aldehydes, formaldehydes and BTEX were evaluated by means of passive diffusive sampling and their concentrations were determined by IC and GC–MS. Multiple-wavelength AEs were employed for determination of Black Carbon in real time. Seven different indoor and one outdoor sampling points were chosen considering collection's importance and microclimatic condition's differences which may cause deterioration of the materials. The first analysis, referring to the period from 5 to 12 February 2014, provides preliminary results of BTEX. Indoor and outdoor average concentrations for benzene, toluene, ethylbenzene, m,p-xylene and o-xyleneare respectively: 2,5 and 3,4 μg/m^3; 22 and 19 μg/m^3; 3,5 and 0,99 μg/m^3; 5,0 and 4,8 μg/m^3; 0,99 and 0,54 μg/m^3. Results are interpreted separately and as a whole with the specific aim of identifying compounds that could contribute to the chemical reactions taking place on the surfaces of artifacts and which could potentially cause irreversible damage to the artworks.

P4.14 - COMPARING STATIC AND DYNAMIC EMISSION INVENTORIES FOR MOBILE SOURCES IN THE METROPOLITAN AREA OF BUENOS AIRES, ARGENTINA

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Localand regional emission inventories play an important role in feeding globalinventories. There are some regions of the world that are not very wellrepresented by global emission iventories due to the lack of knowledgeconcerning sources and their emissions, as it is the case of Argentina andSouth America as a whole. Within the framework of the South American Emissions,Megacities and Climate project SAEMC (http://saemc.cmm.uchile.cl/), a four-year regional project aimed atproviding accurate regional emissions and chemical weather forecast and climatechange scenarios for South America, emission inventories were developed for themain megacities of South America as efforts from local groups. In the framework of SAEMC, staticand dynamic on-road mobile emission inventories for criteria pollutants and greenhousegases weredeveloped for the Metropolitan Area of Buenos Aires (MABA), Argentina, for theyear 2006. The static emission inventory followed the 2006 IPCC guidelines, andcalculated the annual emissions from the registered fleet, following the fueldistribution registered by the registration office and local institutions andemployed an emissions factors database representative for the Latin Americanregion. The dynamic emission inventory followed the International Vehicle Emissionsmethodology (http://www.issrc.org/ive/), which includes performing in-situcampaigns to analyze the composition of the in-use fleet in the studied areaand measures on-board emission factors from the local fleet. The aim of thisstudy is to comparatively assess the obtained results using differentmethodologies and input data, with the attempt to conclude which are the mainadvantages and drawbacks of each approach.

P4.15 - NMVOCS SPECIATED EMISSIONS FROM MOBILE SOURCES AND THEIR EFFECT ON AIR QUALITY AND HUMAN HEALTH IN THE METROPOLITAN AREA OF BUENOS AIRES, ARGENTINA

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Since2007, more than half of the world's population lives in urban areas. Transportemissions dominate urban atmospheres and are an important source of non-methanevolatile organic compounds (NMVOCs) emissions, which cause negative effects onhuman health and intervene in the formation of tropospheric ozone. NMVOCsemissions are generally not well represented in emission inventories and theirspeciation presents a high uncertainty. Ingeneral, emissions from South American countries are still quite unknown forthe international community, and their associated uncertainty is high due tothe lack of available data to compile emission inventories. Within the SouthAmerican Emissions, Megacities and Climate project (http://saemc.cmm.uchile.cl/), an emissioninventory of criteria pollutants and greenhouse gases from the on-roadtransport sector for the metropolitan area of Buenos Aires (MABA), Argentina, wasdeveloped for the year 2006. Theon-road mobile sector of MABA emitted 70 Gg of NMVOCs emissions in 2006.Gasoline light-duty vehicles are responsible for 64% of NMVOCs emissions,followed by compressed natural gas (CNG) light-duty vehicles (22%), and dieselheavy and light duty vehicles (11% and 7%). Total NMVOCs were speciatedaccording to fuel and technology, employing the European COPERT (Ntziachristos & Samaras, 2000)NMVOCs speciation scheme for gasoline and diesel vehicles and the USEPASPECIATE (Simon et al., 2010) profilefor CNG vehicles. NMVOCs emissions are composed of 31% aromatic compounds, 29%linear alkanes, 20% olefins, 12% ramified alkanes, 7% aldehydes and negligiblecontributions from cycloalkanes, ketones, Polycyclic Aromatic Hydrocarbons andother NMVOCs. Aromatic compounds dominate gasoline light-duty vehicles'emissions (~45%), while linear alkanes those of CNG light-duty vehicles (~80%).Aldehydes' contributions increase for diesel vehicles. NMVOCs speciation schemesfor transport emissions were collected from the international literature withthe aim to account for the associated uncertainty by compound for each fuel andtechnology type. The resulting individual NMVOCs emissions were used tocalculate the corresponding tropospheric ozone formation (Carter, 1994), as well as the human toxicity potential. Olefins andaromatic compounds in terms of species, and gasoline in terms of fuels, werefound to impose the highest risk in urban environments regarding air qualityand human health.

P4.16 - IMPACT OF THE EMISSIONS OF AROMATIC HYDROCARBON AND PARTICULATE MATTER FROM BIODIESEL COMBUSTION

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Impact of the emissions of aromatichydrocarbon and particulate matter from biodiesel combustion

Keywords: emissions,biodiesel, ethanol, diesel, fuel.

For some decades the world seeks asustainable development, environmentally appropriate and economically viable. Studiesindicate the need for mitigation measures or reversing the damage alreadycaused to the environment. Among the measures adopted,

Brazil has sought toexpand the use of clean and renewable energy. The country holds a leadingposition in the ethanol production technology. Furthermore, has beenresearching the replacement of diesel fuel with biodiesel.

There are little knowledge about theimpact of the emissions from alternative fuels, therefore this study cared toevaluate the levels of total particulate matter (TPM) and volatile organiccompounds (benzene, toluene,ethylbenzene and xylenes, BTEX) generated by the emission of a stationarydiesel engine using four fuels: B100 (biodiesel), B100 adt. (biodiesel withadditive), B5 (commercial diesel fuel) and 95% ethanol. The fuels were aged ina kiln at 40 °C for 7, 14 and 21 days to assess the effects of the oxidationprocess. The TPM was collected on polycarbonate filters of porosity 0.4 μm indiameter to 37 mm and its concentration determined by gravimetry. The aromaticcompounds were collected on activated carbon cartridges and quantified by gaschromatography with flame ionization detection (GC-FID).

Preliminary results indicate thatthe lowest emissions of particulate matter and BTEX among the tested fuels weregenerated by alcohol. On the other hand, the highest concentrations of BTEXwere measured for B5 (commercial diesel fuel) in all sampling times and also inrelation to aging time, demonstrating that the use of this fuel can cause anegative impact to the environment by presenting a complex mixture of organicpollutants. Interesting to observe that for biofuels (B100 and B100 withadditive) the presence of benzene, toluene and ethylbenzene was also observed.

The aging time showed to be apositive factor in reducing the emissions of organic pollutants for B5, B100and B100 with additive.

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P4.17 - CONSTRAINING MODEL ESTIMATES OF PM2.5 FOR SHORT TERM EXPOSURE: CONSIDERATIONS FOR MORTALITY ESTIMATES

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Because of the increasing evidence of the widespread adverse effects on human health from exposure to poor air quality and the recommendations by the World Health Organization to significantly reduce PM2.5 in order to reduce these risks, it has become necessary to have better estimates of surface air quality globally. However, surface measurements useful for monitoring particulate exposure are scarce, especially in developing countries which often experience the worst air pollution. Therefore, other methods are necessary to augment estimates in regions with limited surface observations.

Recent studies have made use of a “satellite-derived” PM2.5in order to estimate chronic or long-term exposure to outdoor atmospheric pollutants. These studies have used a variety of satellite observations along with model estimates of the aerosol vertical profile to determine surface air quality. This method has proved useful for mortality estimates in regions with limited surface observations and in developing regions where there is less confidence in emission inventories.

However, there is a desire for short-term exposure estimates, especially with regards to extreme events. Therefore, in this current study, we assess the usefulness of using satellite observations to constrain GEOS-Chem model estimates of surface PM2.5 on shorter timescales. We quantify the uncertainties in daily PM2.5 estimates from this method and determine how these uncertainties can impact mortality estimates both in the United States and in China.

P4.18 - THE IMPACT OF THE TWO MAIN AIRPORTS IN RIO DE JANEIRO ON AIR QUALITY

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The impact of aircraft emissions on airquality has been investigated in several recente studies. Twenty years ago,these emissions were considered to be insignificant, but since then this pointof view has been reviewed. Since commercial aircraft spend most of their flighttime in cruise mode and their emissions occur basically in the uppertroposphere and lower stratosphere, research has focused mainly on the impactof their exhaust at regional and global scales. On other hand, some authorsfocused their attention on the air quality in the vicinity of airports. VolatileOrganic Compounds (VOCs) are not routinely monitored in urban air, and noambient air quality standards have yet been established for them. In addition,through complex photochemical reactions, VOCs contribute to the formation oftoxic oxidants such as tropospheric ozone, and peroxy-acetyl nitrate (PAN),which are detrimental to health and are phytotoxic. The main goal of this work wasto determine VOCs in two main airports (Santos-Dumont Airport and AntônioCarlos Jobim International Airport) of Rio de Janeiro and correlate their influence on air pollution in the downtown. VOCs were evaluated by gaschromatography with flame ionization detection (CG – FID) and mass spectrometry(GC – MS), following the U.S. EPA TO-15 methodology. The analyses were carriedout using a Varian 3800 gas chromatograph and a Saturn 2000 mass selectivedetector. The VOCs were identified by a NIST library and quantified using standardmixtures of alkanes, alkenes, aromatics and TO-14 standard mixture. Computer simulationswere performed using an empirical trajectory model implemented in Ozone Isopleth Plotting Program andthe chemical model State-wideAir Pollution Research Centre toassess the impact on theozone formation in the troposphere.

P4.19 - ONLINE AND OFFLINE CHARACTERIZATION OF FINE PARTICULATE MATTER DURING SEVERE HAZE EPISODES IN JANUARY 2013 IN BEIJING, CHINA

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Many cities in China suffered the heaviest particulate matter pollution episodes in January 2013, establishing a new historical record of China. Beijing, the capital city, was one of these cities and received much attention from the world in terms of the cause and impacts of such episodes. In this study, an extensive measurement campaign was conducted using online and offline instrumentation to study fine particulate matter during January 11-31, 2013 in Beijing. Three serious particulate pollution episodes were identified, with two during 11-19 January and one during 26-31 January. One episode exhibited a sharp increase within a few hours to reach hourly PM2.5 concentration as high as 828µg/m3, and the last episode had a slow increase first, followed by a slow decrease over the last few days of January. The characteristics and formation mechanisms of these high PM2.5 pollution episodes were discussed. Unfavorable meteorological conditions (e.g. lower mixing layer height, lower wind speed) prohibited effective atmospheric dispersion. Physical and chemical characteristics of gaseous pollutants and fine particulate matter were compared between different haze episodes and between haze and non-haze periods. It was found that secondary species (e.g. secondary organic aerosol, sulfate, nitrate and ammonia) played an important role and were key contributors to fine particulate matter during these episodes, which also showed a positive and close correlation with relative humidity. During non-haze periods, primary organic carbon (POC) was more important compared to secondary organic carbon (SOC) and carbonaceous aerosol dominated PM2.5 while in haze days secondary species contributed significantly to PM2.5 and OC/EC ratio ranged from 2.7 to 10.9, indicating the influence of secondary organic aerosol. The result agreed well with the estimate of secondary organic aerosol from the organic tracer-based method.

P4.20 - PAH ATMOSPHERIC CONTAMINATION AND SOURCES IN RIO DE JANEIRO METROPOLITAN AREA, BRAZIL

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Atmospheric particles sampled from Rio de JaneiroMetropolitan Area (RJMA) was analyzed by CG/MS in order to characterize thearomatic and aliphatic hydrocarbons fractions. In total 236 samples from sixdifferent sites were sampled weekly over 2011, composing a robust atmosphericcharacterization of fine particulate matter (PM2.5). Low hydrocarbon atmospheric concentration was foundcompared to previous studies, possible associate to a fuel composition changeover time. Precipitation is the main meteorological parameter that rulesparticulate and hydrocarbon concentration, also changing polycyclic aromaticsample constitution by scavenging. Aliphatic and aromatic diagnostic ratiosthresholds, widely applied in literature, were in no accordance with valuesreported and with each feature area. These ratios, however, can be applied todeterminate gradient sources among sampling sites and segregate them.hydrocarbon typology, diagnostic ratios and principal component analysis (PCA) associatedwith multiple linear regression were able to identify vehicle emission,specially gasoline derived, as mainly hydrocarbon source to atmosphericparticulate matter.

P4.21 - EVALUATION OF NOX AND VOC CONCENTRATIONS WITH THE EURAD - IM ATMOSPHERIC CHEMISTRY MODEL OVER THE STATE OF RIO GRANDE DO NORTE-RN, BRAZIL

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Little is known about the chemicalcomposition of the lower atmosphere over the Northeastern region of Brazil(NEB). This region has a shortage of observational data to determine emissionfluxes from agricultural activities and other sectors, among others: fires,vehicular transports, industries, as well as evaluation directly by the use ofobservations of atmospheric concentrations of trace gases and aerosols. Thisstudy emphasizes the atmosphericcomponent of the nitrogen cycle. y, dueto its importance for the functioning ofaquatic and terrestrial ecosystems. Nitrogen compounds have increasedsignificantly in the last three decades causing environmental changes on alarge scale. In parallel to the current initiatives of collecting observationaldata in Natal, lead by CTGÁS-ER (Center for

Gas Technology and Renewable Energies)in cooperation with INPE-CRN (National Institute of Space Research - Northeast RegionalCenter-Natal), among others, and the newly established research group Modelingand Observation of the Atmosphere (GP-MOQA) at UFRN, the latter is adapting anatmospheric chemistry model for the region. The modeling approach is animportant tool for the interpretation of observational data and, it provides a completespatial and temporal coverage of the chemical state of the atmosphere. Themodel that is being adapted is the European Air Pollution Dispersion Model /Inverse Model (EURAD-IM), a model of mesoscale chemical transport, whichinvolves transport, diffusion, chemical transformation, wet and dry depositionof trace gases and aerosols in the lower atmosphere.

We present a first case study of airpollution dispersion in Rio Grande do Norte analyzing the performance of VOCand NOX simulations. TheWeather Research and Forecasting-WRF meteorological model calculates themeteorological fields for the EURAD-IM model with respect to temperature,relative humidity, precipitation and wind speed and -direction near thesurface. Available chemical and meteorological observations will be used forevaluation of the model's performance.

P4.22 - MEASUREMENT OF GREENHOUSE GAS EMISSIONS FROM LANDFILLS IN DELHI, INDIA

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Abstract:

Landfills are important anthropogenic sources of emissions of greenhouse gases (GHGs), especially of methane. A study was carried out for measurement of GHGs, namely methane (CH4), carbon dioxide (CO2)and nitrous oxide (N2O) in three landfills of Delhi city namely Ghazipur (GL), Bhalswa (BL) and Okhla (OL) during 2008 to 2012 period using the static chamber method for sample collection which were brought back to laboratory for gas chromatographic analyses of CH4, CO2 and N2O for development of landfill specific emission factors for use in emission inventory preparation.

The results show a large seasonal variability in emission fluxes of CH4 and CO2 with highest fluxes occurring during summer season, lower in winter season and lowest in monsoon season. The N2O emission fluxes show only small seasonal variability. CH4 emissions have been found as 1046±339, 1553±654 & 1219±427 mg m-2h-1 from GL, BL and OL respectively during winter season. In summer season, it is found to be 2991±1011, 2446±858 & 1410±537 mg m-2 h-1 from GL, BL and OL respectively. The monsoon season shows CH4 emission fluxes as 886±252, 803±261 & 702±205 mg m-2 h-1 from GL, BL and OL respectively. CO2 emission fluxes have been found to be 6595±1418, 7754±2309 & 4016±1314 mg m-2 h-1 during winter season; 10518±3223, 9956±4168 & 5824±2033 mg m-2 h-1during summer season and 4468±1309, 4912±2703 & 4152±1602 mg m-2 h-1 during monsoon season from GL, BL and OL respectively. The N2O emission fluxes have been found to be 1210±329, 998±298 and 944±339 µg m-2h-1 from GL, BL and OL respectively. These emission fluxes have been used to generate landfill specific GHG emissionfactors and GHG emission estimates. Generated CH4 estimateshave been compared with FOD model basedestimation which reveals waste characteristics as the major factor influencing estimations basedon FOD method.

P4.23 - CHEMICAL CLIMATOLOGY OF OZONE: DEVELOPING AN IMPACT BASED FRAMEWORK

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In 1872 Scottish chemist Robert Angus Smith established the basis of 'chemical climatology' explicitly designed to assess the human health impact of the 'man-made climates' in cities. Since then usage of chemical climatology has been sporadic. However with large volumes of atmospheric composition datasets available from campaign measurements, monitoring and modelling, as well as pollutant impact studies, an updated framework based on Angus Smith's principles would be useful as a resource for both scientists and policy makers. Through analogy with the use of the term climate in other areas (e.g. meteorological or political) a modern chemical climatology framework is described, highlighting impact-focused principles. To derive the chemical climatology the impact of atmospheric composition is first identified (e.g. damage to human health). The impact is linked to the state of atmospheric composition in time and space (e.g. ozone concentrations in the UK 1990-2010), and the drivers of the state are then assessed (e.g. emissions, chemical background, chemical precursors, meteorology).

Two chemical climates are presented: of O3 on human health and on vegetation. The chemical climates are derived from measurements at the two UK European Monitoring and Evaluation Programme (EMEP) monitoring 'supersites': Auchencorth Moss and Harwell. The impacts of O3 on human health and on vegetation are assessed using the SOMO35 and AOT40 metrics respectively. Drivers of significant spatial variation in these impacts across the UK, and temporal changes at Harwell between 1990 and 2011 are discussed, as well as the relative importance of hemispheric, regional andlocal O3 chemical processing and its precursors. The individual site assessments are placed in regional context through the statistical evaluation of O3 variation across Europe.

The chemical climatology framework allows for collation of individual scientific studies which focus on a specific subset of processes relevant to an impact, state and/or driver into an integrated chemical climate. This approach provides opportunities for developing the understanding between different atmospheric composition impacts, including the identification of common drivers, and potentially holistically considered mitigation strategies.

P4.24 - A CHEMICAL CLIMATOLOGY ASSESSMENT OF THE ROLE OF VOCS IN OZONE FORMATION AT THE UK EMEP SUPERSITES

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Understanding the role of individual volatile organic compounds (VOCs) in the formation of surface ozone is important for the effective targeting of ozone mitigation strategies. The UK operates two European Monitoring and Evaluation Programme (EMEP) monitoring 'supersites' where concurrent measurement of 27 VOCs, NOx and ozone allows relationships between these precursors and ozone to be explored. This work presents the relative contribution of measured VOCs on ozone formation at the 'supersites',including spatial variation across the UK, and temporal changes between 1999 and 2012. The study was undertaken using the impact-focused chemical climatology framework (Malley et al., 2014).

Regional components of ozone concentrations are distinguished from hemispheric background ozone and measured ozone concentrations which show depletion due to the local NOx environment. Increased VOC photochemical cycling is observed during periods of regional ozone formation, and the contribution of individual VOCs to this total measured VOC cycling is discussed, with ethene and m+p-xylene consistently showing greatest photochemical cycling during regional ozone production. The drivers of this photochemical depletion, such as meteorology and emissions are evaluated. Back trajectories are coupled with gridded VOC emission maps to estimate the exposure of trajectories to VOC emissions for the four days prior to their arrival at the receptor site. These emissions are disaggregated into 11 broad source sectors, and their contribution is evaluated. A majority of emissions exposure derive from UK emissions sources, on average 63% in 2011, and from SNAP source sector 6, solvent and product use (50% total emissions in 2011) The implications of the level of source disaggregation available are discussed in terms of its limitations on VOC emissions speciation to estimate the exposure of receptor sites to individual VOCs. Using the SNAP sector and the NFR code sector data, it is demonstrated that a greater level of source sector disaggregation would benefit atmospheric model studies and policy determination.

References

Malley, C. S., Heal, M. R., Braban, C. F., 2014. New Directions: Chemical climatology and assessment of atmospheric composition impacts. Atmospheric Environment, http://dx.doi.org/10.1016/j.atmosenv.2014.01.027.

P4.25 - USE OF RECEPTOR MODELS IN AEROSOL SOURCES QUANTIFICATION AND SOIL COMPOSITION CHARACTERIZATION IN SAO PAULO'S METROPOLITAN REGION

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Many studies are made about theatmospheric pollution in Sao Paulo's Metropolitan region, urban area witharound 20 million inhabitants, 7.8 million vehicles and 40 million industries. Industrialand vehicular emissions compromise air quality and one of the challenges is toidentify and quantify the contribution from these sources to help thedevelopment of public policies aimed at pollutants emission reduction. In orderto analyze the elemental composition of the particulate material for posterior interpretationby receptor models, aerosol particles were collected in four sites.

Congonhas' is the one mostimpacted by vehicular emission, due to intensive traffic and local geography, whichhampers the dispersion of pollutants. Cerqueira Cesar station is also highlyimpacted by vehicular emissions and due to its high altitude; it is affected bothby local emission and atmospheric transport from other regions. The station withinIbirapuera's park, although surrounded by high traffic avenues, has almost nullvehicular emission in a 300m radius. Possibly due to the local emission ofVolatile Organic Compounds by the vegetation, this station indicates some ofthe highest Ozone concentration values in Sao Paulo. USP's station is not muchaffected by vehicular emissions, being also a well ventilated location thatallows sampling air from Sao Paulo's West Zone's Industrial Region, resultingin a wider scale analysis. In order to improve the interpretation of the receptormodels, soil samples were collected in each site and resuspended to allow adetailed characterization of its composition.

Through gravimetric analysis, itwas determined the mass of aerosol, the BC concentration as well as theelementary concentration. The BC analysis was made through reflectance; theanalysis of organic compounds through the differential thermal analysistechnique. X-Ray Fluorescence was used for the determination of elementarycomposition.

The mass concentration was ascertained through gravimetricanalysis of the Nuclepore filters, in coarse and fine mode. For USP, CerqueiraCesar and Ibirapuera sites, the average fine mass concentration is 9.6, 11.2and 12.2 μg/m³ respectively and the average coarse mass concentration is 16.4,15.2 and 18.6 μg/m³ respectively.

P4.26 - INTERACTION BETWEEN OZONE PRECURSORS AND PHOTOACTIVE ROAD MATERIALS: POTENTIAL IMPLICATIONS FOR AIR QUALITY.

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Vehicle emissions are a major source of pollution particularly in urban areas resulting in a large impact on public health. Pollution control tools targeting mobile sources have been successful in reducing emissions in the last decades. Further reductions are challenging as the most cost effective tools have already been implemented. Photoactive roadways have been suggested as an efficient alternative to improve air quality and near-road conditions by removing pollutants at the source before they are dispersed. However, several laboratory studies have shown formation of nitrous acid (HONO) during NOx removal suggesting that this technology could constitute an additional source of radicals in urban areas.

We performed chamber experiments to determine reaction probabilities between ozone precursors and TiO2-treated asphalt and concrete samples, two of the most common roadway materials.Pollutants studied included NOx and VOC commonly found in vehicle exhaust. The photocatalytic process was studied against parameters such as UV irradiation,relative humidity, concentrations and residence time. Our results indicate that despite being efficient in removing pollutants, photoactive asphalt samples area source of HONO during photocatalytic oxidation of NOx, and that both photoactive asphalt and concrete constitute an important source of aldehydes during the photocatalytic removal of VOC. Furthermore, we found that competitive adsorption between VOC in mixtures results in preferential removal of compounds with lower vapor pressure, suggesting important implications for the removal of gasoline versus diesel exhaust. To further understand the potential impact of adopting such technology, we incorporated the reaction probabilities determined experimentally to modify deposition velocities of pollutants in a 1-D model, as well as the molar yields of the byproducts identified. The end goal is to determine how the balance between removal of ozone precursors and release of radical sources affects ozone formation rates in urban areas. The outcome of this project will help informing regulators and policy-makers on the net benefits of adopting this technology as an air quality management strategy.

P4.27 - AN INTEGRATED AIR QUALITY MODELING SYSTEM FOR THE METROPOLITAN AREA OF BUENOS AIRES

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With the aim to gain knowledge in the understanding of the relationshipsof air pollutants concentration and the emission patterns of the MetropolitanArea of Buenos Aires

(MABA), two coupled chemistry transport modeling systems,CCAT-BRAMS and WRF-CHEM, were implemented. We evaluate the simulations of carbon monoxide (CO)and meteorological data under average winter conditionsand also in association with an intrusion of a polar air mass, againstlocal observations taken from three National Weather Service meteorologicalstations and the only monitoring station with reliable data for the studiedperiod. Extensive numerical experiments of both models were performed in orderto identify the optimum setting that best describe both meteorological and airquality measurements.

The modelswere configured with two nested domains that have grids of 12 and 3 km, with initialand boundary conditions taken every 6 hours from CPTEC/INPE CCATT-BRAMS,-considering the RELACs chemical mechanism and spin-up of 3 days. The Prep-chememissions preprocessor has been implemented in both models with the option thatallows the integration of EDGAR and RETRO global emission databases with arecently developed regional emission inventory for mobile and stationarysources.

The resultsindicate that the models performances are good enough to represent the meteorologicalvariability of the studied area and to simulate the synoptic situationanalyzed. Nevertheless soil humidity initial conditionsmay be improved to obtain a better representation of surface water patterns.

Carbonmonoxide and nitrogen oxides diurnal cycles, inter-diurnal variability and therelationship between carbon monoxide, nitrogen oxides and ozone were obtained.From the comparison with observations CO mixing ratios show a good trendrepresentations but a lower simulated valued, with a range of modelled-to-observedcorrelation coefficients between 0.75 – 0.87, root mean square between 0.75 and0.90 and standard deviation between 0.72 and 0.90. The difference can berelated with an underestimation of the emissions from the old gasoline passengercars that represents to 60% of the total CO emissions and presents a highuncertainty value.

P4.28 - DEVELOPMENT OF SIMULATING AEROSOLS AND TROPOSPHERIC OZONE IN MEGACITIES USING A GLOBAL NONHYDROSTATIC MODEL WITH A STRETCHED-GRID SYSTEM

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An aerosol-chemistry-coupled global non-hydrostatic model with a stretched-grid system has been developed and tested. The dynamic model is Nonhydrostatic IcosahedralAtmospheric Model (NICAM; Tomita and Satoh, Fluid. Dyn. Res. 2004; Satoh et al., J.Comput. Phys. 2008), which originally has a uniform grid system, can concentrate horizontal grid points at a region of interest using a Schmidt transform scheme. As a result, horizontal grid intervals will gradually become smaller at the focusing region to save computational resources. Also, unlike regional models, neither nesting techniques nor boundary conditions are required, and therefore, errors that generated at the lateral boundaries can be totally ignored. The aerosol-chemistry model is based on SPRINTARS (Takemura et al., J. Geophys. Res., 2005) and CHASER (Sudo et al., J. Geophys. Res., 2002). In this study, we integrated the aerosol-chemistry-coupled model with a horizontal resolution of approximately 10 km around Tokyo. We determined that the model was capable of consistently recreating accurate fields of meteorological variables, primary (e.g., elemental carbon) and secondary aerosols (e.g., sulfate), and short-lived gases (e.g., ozone and SO2) to those obtained by in-situ measurements and with other regional model. We believe that the model is capable of predicting amount of pollutants in the atmosphere over the various cities/region in detail, also in a foreseeable future; an original uniform grid system can be directly applied for such air-quality simulations to look at the whole globe in fine resolutions.

P4.29 - IMPACTS OF SUGARCANE STRAW BURNING ON AIR QUALITY

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Sugarcane is a relevant feedstock for the Brazilian economy used to produce sugar and ethanol in almost equal proportions. The state of São Paulo is the largest sugarcane producer and is responsible for almost 60% of the Brazilian production, owning a cultivated area of about 5.4 Mha in 2011. The sugarcane harvest can be performed either with or without the pre-harvest straw burning practice and close to 2 Mha have been annually harvested from 2006 to 2010 with the pre-harvest burning practice that emits particulate material, greenhouse gases and tropospheric ozone precursors to the atmosphere. Even with policies to eliminate the practice of pre-harvest sugarcane burning in the near future, there is still significant environmental damage. Moreover, this practice can injure health of resident population in the vicinity, making them more susceptible to diseases, above all respiratory ones. A larger number of people can be subject to its effects since many urban areas are typically located next to sugarcane cultivated areas as well as ethanol and bioelectricity plants. Therefore, this work aimed to assess the impacts of sugarcane straw burning in the state of São Paulo on air quality, in 2006 and 2011, using the CCATT-BRAMS atmospheric chemistry model. The results of this study showed that the spatial resolution of 10 km is enough to consistently simulate the diurnal cycle and the monthly variability of the main pollutants considered in this paper: CO, NOX and O3. The effects of the emissions associated with the practice of sugarcane straw burning may exceed the local level and also affect the chemical composition of the atmosphere in neighboring states, in particular, Mato Grosso, Mato Grosso do Sul, Minas Gerais and Paraná. Emissions estimates for the state of São Paulo indicate a decrease of the contribution of the sugarcane straw burning in the concentration of pollutants in the atmosphere for the year 2011 in relation to 2006, consistent with the reduction in the practice of sugarcane straw burning in this state, indicating that the measures taken by the government to reduce sugarcane straw burning emissions in the state of São Paulo are becoming effective.

P4.30 - TRENDS IN AEROSOL PARTICLES IN BUENOS AIRES

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The longest continuous measurement campaign ever to be conducted in Buenos Aires was carried out in 2011 to determine certain characteristics of particulate pollution. This was a collaboration between universities in Mexico and Argentina. Measurements of particle mass (PM10), equivalent black carbon (eBC), condensation nuclei (CN) concentration and mass of particle bound poly-aromatic hydrocarbons(PPAH) were made near the east central area of Buenos Aires from April 15 –December 6, 2011. The light scattering and absorption coefficients were also measured from which the extinction coefficient and single scattering albedo were derived. Vertical profiles were made of aerosol backscattering using a ceilometer with a range of 7.5 km. Aerosol optical depth was measured with a nearby AERONETphotometer. Simultaneous measurements of wind and state variables were also made.The air mass history was determined every six hours using back trajectory analysis and the hourly boundary layer height was derived from the ceilometer profiles.

Distinctive trends are detected in the CN, PPAH and eBC concentrations, increasing from fall to winter, with maxima at the winter equinox of 55000 cm-3, 500 ng m-3and 400 ng m-3 in CN, PPAH and eBC, respectively. The diurnal variations are related to the air mass origin prior to reaching the measurement site that was located on the roof of a university building at an altitude of 30 m a.s.l. Strong correlations between the CN, PPAH and eBC suggest that the majority of particles come from local combustion sources. The diurnal variations indicate that this source is from vehicular traffic, although the nearby power plant that uses fuel-oil, was another possible source of increased particle concentrations.

Evaluation of the vertical profiles of backscattering show the daily growth and collapse of the mixed layer that are dependent upon the source of the air mass at the measurement site and the meteorological conditions. The highest particle concentrations are at times associated with a shallow mixed layer but this was not a consistent pattern.

P4.31 - LOWER TROPOSPHERIC OZONE CONCENTRATIONS: COMPARING CHEMISTRY-CLIMATE MODELS AND OBSERVATIONS

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Several recent papers have quantified long-term O3changes and seasonal cycles observed at sites that are believed to representbaseline (here understood as representative of continental to hemisphericscales) conditions. Most attention hasbeen paid to northern mid-latitudes, but some results are available world-wide. Three chemistry climate models (CAM-chem run at NCAR, GFDL-CM3 andGISS-E2-R) have calculated retrospective tropospheric O3 concentrations as part of the ACCMIP andCMIP5 model intercomparisons. We presentapproaches for quantitative comparisons of model results with measurements, forabsolute O3concentrations,their long-term changes, and seasonal cycles. We find considerable qualitative agreementbetween the measurements and the models,

but there are also substantial andconsistent quantitative disagreements. Preliminaryresults indicate that the three CCMs reasonably reproduce the absolute O3concentrations, their long-term changesand the seasonal cycles measured in the southern hemisphere and thetropics. However, poorer results arefound for the northern mid-latitudes, where models 1) overestimate absolute O3 mixing ratios, on average by ~5 to 17 ppbv inthe year 2000, 2) capture only ~50% of O3 changes observed over the past five to sixdecades, and little of observed seasonal differences, 3) capture ~25 to 45% ofthe rate of change of the long-term changes, and 4) do not reproduce theobserved historical shift in the phase of the seasonal cycle at northernmid-latitudes. Thesedisagreements are significant enough to indicate that only limited confidencecan be placed on estimates of present-day radiative forcing of tropospheric O3derived from modeled historic concentration changes and on predicted future O3concentrations. Evidently our understanding of tropospheric O3is incomplete, at least as it isincorporated into current chemical climate models. Modeled O3 trends at northern mid-latitudes approximatelyparallel estimated trends in anthropogenic emissions of NOX, animportant O3 precursor,while measured O3 changesincrease more rapidly than these emission estimates.

P4.32 - THE ATMOSPHERIC COMPOSITION GEOSTATIONARY SATELLITE CONSTELLATION FOR AIR QUALITY AND CLIMATE SCIENCE: EVALUATING PERFORMANCE WITH OBSERVATION SYSTEM SIMULATION EXPERIMENTS

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Advances in tropospheric remotesensing over the past decade have shown the potential of satellitemeasurements to quantify the sources and distributions of gasesimportant for air quality and climate. However, current satellite observationsof tropospheric composition are made from low Earth orbit and provide atbest one or two measurements each day at any given location. Coverageis global but sparse, often with large uncertainties in individualmeasurements that limit examination of local and regional atmospheric compositionover short time periods. This has hindered the operational uptake of thesedata for monitoring air quality and population exposure, andfor initializing and evaluating chemical weather forecasts.

By the end of the current decadethere are planned geostationary Earth orbit (GEO) satellite missions foratmospheric composition over North America, Korea and Europe with additionalmissions proposed. Together, these present the possibility of achieving aconstellation of geostationary platforms to achieve continuous time-resolvedhigh-density observations of continental domains for mappingpollutant sources and variability on diurnal and local scales. We describeObserving System Simulation Experiments (OSSEs) to evaluate the contributionsof each planned GEO mission to improve knowledge of near-surface air pollutiondue to intercontinental long-range transport and quantify pre-cursor emissions.We detail the requirements on chemical transport modeling, measurementsimulation and data assimilation for a successful OSSE infrastructure. Finally,we report on international collaborations using the OSSE approach to determineexpected performance of planned satellite systems and set requirements forfuture missions.

P4.33 - STUDY OF MAJOR PRECURSORS OZONE IN THE METROPOLITAN AREA OF SÃO PAULO

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Ozone (O3) is a pollutant that presents great concern in terms of air quality in the metropolitan area of São Paulo (MASP). In 2012 , 98 days of exceedances of the standard value(160 µg m-3) for hourly averages for this pollutant was observed in the MASP. The focus of this study was to determine the main Volatile Organic Compounds (VOCs) precursors of O3which controls this pollutant.

The samples were taken at the Company of Environmental Sanitation Technology of the State of the São Paulo (CETESB) IPEN/USP station in University City, 800 m altitude, in the west of the city of São Paulo during the period September 2011 until August 2012, when 66 hydrocarbons samples were collected, 62 of aldehydes and 42 of ethanol, on weekdays, 07:00 am to 09:00 am, due to the fact that, in this time, the traffic is heavy and the solar radiation is low.

For sampling of hydrocarbons (HCs) canisters were used .The HCs were analyzed by the technique of gas chromatography (GC) with mass spectrometry detector (MS) and flame ionization (FID). Sampling of aldehydes was done using C18 silica coated cartridges through the technique of high performance liquid chromatography with ultraviolet detector. The ethanol samples were collected from florisil cartridges and analyzed using GC-FID.

The aldehydes represented 35.3% of VOCs concentrations analyzed in the atmosphere, followed by ethanol 22.6%, aromatics 15.7%, alkanes13.5%, ketones 6.8%, alkenes 6.0% and alkadienes <0.1%. Considering the concentration of the compounds and their reactivity, the simulations executed with the model Ozone Isopleth Package for Research (OZIPR) showed that acetaldehyde contributed with 61.2% to the formation of O3 in the atmosphere of MASP in the year 2011-2012. The class of aldehydes contributed with 74% of the production of O3, aromatics 14.5%, alkenes 10.2%, alkanes 1.3% and alkadienes (isoprene) 0.03%. The ratio VOCs/NOx found during this study for the spring, summer, autumn and winter seasons were 4, 3, 3 and 2, respectively. Decrease in the concentration of VOCs in the MASP will result in the decrease of the ozone concentration.

P4.34 - CHARACTERIZATION OF FINE PARTICULATE MATTER IN SÃO PAULO, BRAZIL: RESULTS FROM OFFLINE MEASUREMENTS.

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Megacities emissions are increasingly becoming aglobal issue, where emissions from the transportation sector play an importantrole. The São Paulo Metropolitan Area (SPMA), located in Southeast of Brazil,is a megacity with a population of 18 million people, with 7 million cars andlarge-scale industrial emissions. To improve the understanding of aerosolcomposition and life cycle in this megacity a source apportionment study,combining online and offline measurements, is currently taken place. Aerosolswere collected at 4 sites, with inorganic and organic component being sampled. Organicand elemental carbon were measured using a Sunset Laboratory Dual Optics(transmission and reflectance)

Carbon Analyzer. About 22 trace elements hasbeen measured using polarized X-Ray Fluorescence (XRF). Aerosol mass and blackcarbon were also measured. The average PM2.5 mass concentration obtained were9.6, 11.2 and 12.2 μg m-3 for the University site, Downtown site and Park site,respectively, indicating a relatively well mixed aerosol over the São Paulo metropolitanarea. At all sites, organic matter (OM) has dominated fine mode aerosolconcentration with 42 to 60% of the aerosol mass. Correspondingly, EC accountedfor 23%, 21% and 31% of fine mode aerosol mass concentration. Finally, sulfateaccounted for 26%, 23% and 21% for the University, Downtown and Park sites. Thesum of these species with other trace elements has shown good agreement withgravimetrically obtained aerosol mass concentration. Aerosol sourceapportionment will be done with receptor analysis and integration with onlinedata such as PTR-MS, Aethalometers, Nephelometers and ACSM.

P4.35 - REGIONAL TO URBAN CHEMISTRY AND ITS CONTRIBUTION TO AIR QUALITY EPISODES

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Regional chemistry transport models simulate the emissions,chemistry and transport of air pollution over large geographical areas, but are unable to resolve the very fine-scale emissions and dispersion within the complex urban environment. Conversely, urban-scale dispersion models allow simulation at roadsides and emission hotspots but rely on local observations to provide the background atmospheric composition and thus provide no information on the origin of transported pollution. To bridge this gap, we have coupled the EMEP regiona lchemistry transport model to the ADMS urban dispersion model. The nested modelling approach uses EMEP driven by the Weather and Research Forecasting(WRF) model to simulate atmospheric chemistry at 50 km horizontal resolution over W. Europe and at 5km resolution over the UK. ADMS then uses the 5kmresolution results as boundary conditions to simulate air quality over the London megacity. Validation of daily mean and maximum simulated O3and PM2.5 and PM10 against measurements demonstrates that this coupled nested model gives a significant improvement over EMEP-only 5km model results mainly due to the explicit representation of the high concentration gradients that occur close to road sources. Higher percentile values of simulated O3 and PM also compare well with monitor observations. However, when thresholds are considered, small model biases can lead to substantial model-observation differences in numbers of exceedances of air quality standards e.g. of daily maximum 8-hour running meanO3. We are currently evaluating coupled model performance for large-scale pollution episodes that extend over several days using the nested model to estimate the fraction of regionally transported pollution versus local emission/production. Outdoor pollutant concentrations are being linked through building physics and building stock models for London to produce indoor pollution estimates as part of a larger project examining the health effects of multi-pollutants and weather.

P4.36 - ANALYSIS OF AEROSOL PM2.5 AND PM10 MEASUREMENTS IN THE CITY OF NATAL- RIO GRANDE DO NORTE (RN) – BRAZIL

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In the Brazilian Northeast very few or no data on atmospheric chemistry and air quality are available, neither in urban nor in rural areas. The Center of Gas Technologies and Renewable Energy (CTGÁS -ER) measured for the first time aerosol mass concentrations of PM2.5 and PM10 in the city of Natal, capital of the state of Rio Grande do Norte (RN) during the years 2011 and 2012. In this study we present an analysis of the behavior and origins of particulate matter measured at this urban CT Gás site by using the Lagrangian Hybrid Single- Particle Lagrangian Integrated trajectory model (HYSPLIT). The HYSPLIT model is a tool for analysis of backward trajectories and transport of air masses, chemical, biological and nuclear agents in order to identify the origin of these and its influence on particle levels observed in Natal -RN. We identify the potential origins of the particulate matter in view to the importance of these emissions on air quality, as well as analyze their transport.

P4.37 - SIZE COMPARISON OF THE MONOMERS FORMING SOOT AGGREGATES FROM DIESEL AND BIOMASS BURNING EMISSIONS

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Soot aggregates, product of combustion processes, are a complex dynamic unit in the atmospheric system. Their physicochemical properties strongly vary with combustion technology and fuel from the emission point as well along the whole life cycle in the atmosphere. Understanding the structural evolution of these aerosols within the atmospheric pool and under different conditions is a key to solve relevant questions regarding climate or health related issues. Changes in the monomer diameters in this type of structures seem to be directly related to the aggregate's optical properties and dynamics, and thus fundamental to completely understand their role in the atmosphere.

The present study aims to characterize the monomers forming those carbonaceous aggregates within some diesel exhaust and biomass burning experiments and compare it with previous results reported in the available literature. A Jeol 6500F, FEI© Sirion 400 and a Hitachi S-5500 In-lens ultra-high resolution field emission electron microscope were used to determine the size of the spherules and any other particles comprising the aggregate's core. Image magnification ranged from 100,000 to 500,000.

The size of the primary particles (monomers) contained in the laboratory generated diesel exhaust ranged from 10 to 50 nm, fitting unimodal size distribution with a maximum peak on 22 nm. For biomass burning, the size distribution of the primary particles comprising the aggregates presented one or two modes, the smaller curve with particles ranging from 10 to 100 nm and a second mode for particles larger than 100 nm (non graphitic tar-balls).

The microscopy of this study has been conducted at RJ Lee Group, Inc. and Centro Nacional de Microscopía Electrónica (Universidad Complutense de Madrid) with support

the AEROCLIMA project (CIVP16A1811) by Fundación Ramón Areces and MICROSOL project (CGL2011-27020). Particles from biomass combustion were obtained within the AIRUSE project – Testing and Development of air quality mitigation measures in Southern Europe (LIFE 11 ENV/ES/000584) and BiomAshTech (PTDC/AAC-AMB/116568/2010 - FCOMP-01-0124-FEDER-019346).

P4.38 - TOXICOLOGICAL ANALYSIS OF DIMETHOATE, CARBARYL, IPRODIONE AND 4,4”–DDE WITH THE BIOMONITOR TRADESCANTIA PALLIDA VAR. PURPUREA AND TRADESCANTIA CLONE KU-20

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Valparaíso is one of the regions inChile with the greatest agricultural potential, supplying much of the localmarket. Pesticides and other agricultural chemicals are commonly used in theproduction processes, generating hazardous wastes which can damage people healthand the environment atmosphere. Pesticide residues represent a risk especially tolocal consumers because to the absence of sanitary controls and the potential toxicity,mutagenicity and carcinogenicity of these chemical compounds.

Due to the effect on the health ofpeople and the environmental relevance of the pesticides residues, the Centrefor Environmental Technology (CETAM) evaluated the mutagenicity of fourpesticides; dimethoate, carbaryl and iprodione; additionally 4,4’–DDE, a breakdown product of DDT found as soilresidue in our region, was included in this study. Tradescantia biomonitors were used to carry out the Tradescantia Stamen HairBioassay (Trad-SH) using T. clone KU-20 and the Tradescantia Micronucleus Bioassay (Trad-MCN) using Tradescantia pallida var. purpurea. Thewell-known mutagen sodium azide (80 mg L-1) was selected as positive control.

Biomonitor Inflorescences wereexposed during 8 hours to the evaluated pesticides, which were prepared inaqueous solution in a wide range of concentrations, including the maximumresidue limits and the application doses, except for 4,4’–DDE (0.01, 0.1 and 1 mgL-1). Pesticides were absorbed by the biomonitorthrough their stems (xylem pathways). The Trad-MCN proved to be sensitive to 4,4’-DDE at 1 mg L-1, to dimethoate in the range from 40 to 400 mgL-1 and forcarbaryl at 889 mg L-1 (application dose). These results wereconsistent with their lethal dose (LD50). In the case of Trad-SH bioassay, thebiomonitor showed positive response only for dimethoate at low doses (0.2 and 0.5mg L-1). Inconclusion, the application of Tradescantia bioassays can be a good option for toxicologicalmonitoring of agricultural products and to watch occupational safety. Further studies will be interesting to evaluateTradescantia´s responses for polluted air with gaseous form of pesticides aswell as increase the number of pesticides that can be detected.

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P4.39 - PARTICULATE MATTER CONCENTRATION IN PIZZERIAS: A CASE STUDY FOR SÃO PAULO CITY.

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Alot of anthropogenic activities and natural processes can be sources ofatmospheric pollutants. Some of them can cause damage to environment and humanhealth, like particulate matter (PM). PM with diameter less than 2.5 um (PM2.5)is more dangerous to human health. São Paulo - with more than 19 millioninhabitants, 7 million vehicles, as well as the major industrial andtechnological park of the country - has high concentrations of air pollutants,especially during the winter. PM2.5 makes part of the vegetal firewood,widely used in Brazil in different restaurants as fireplaces, steam generation,pizzeria ovens and steak houses. It is estimated that 1,500 million pizzas perday are made in São Paulo using firewood to cook them. In this study PM2.5has been monitored in three pizzerias in São Paulo, during three days, insidethe pizzeria and close to the chimney. Two of them using natural firewood andone using wood briquettes. These samples were analyzed by gravimetric andoptical reflectance techniques for mass and Black Carbon (BC) concentrationsrespectively. Concentrations close to the chimney were extremely high comparingto usual urban sites. PM2.5and BC average concentrations for indoorsamplings were 70 and 25 ug/m3, respectively. Outdoor concentrationswere 6,100 and 1,300 ug/m3 also for PM and BC, respectively. Woodbriquettes presented lower concentrations.

P4.40 - THE TASK FORCE HEMISPHERIC TRANSPORT AIR POLLUTION: QUANTIFYING THE IMPACTS OF REGIONAL AND HEMISPHERIC POLLUTION

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The Task Force on Hemispheric Transport Air Pollution (TFHTAP) is an international cooperative scientific effort to improve the understanding of the intercontinental transport of air pollution across the Northern Hemisphere. The TF HTAP was organized under the auspices of the Convention on Long Range Transboundary Air Pollution in 2005. During 2012-2016 TF HTAP scientists address six themes: 1) development of emissions inventories and projections; 2) global and regional modeling of source-receptor relationships;3) model to observation comparison and process evaluation; 4) assessment of impacts on health, eco-systems, and climate; 5) assessment of climate change on air pollution; and 6) development of a data network and analysis tools.

In this overview we outline the issues pertinent to hemispheric transport of air pollution. We present first results for the HTAP Phase2 model multi-model experiments, where a number of global and regional model use a harmonized modeling set-up to evaluate the impacts of long-range transport on regional air quality- from regional to global scales. This presentation is given on behalf of the HTAP modeling team.

P4.41 - SOURCE IDENTIFICATION, CHARACTERIZATION AND HUMAN RISK ASSOCIATED TO PM2.5 IN SEVEN BRAZILIAN CITIES

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The composition of the atmospheric aerosol with aerodynamic diameter less than2.5µm (PM2.5), collected in an urban center, contains a mixture oflocal air pollution sources. The prolonged exposure to air pollution isdirectly associated with lung cancer, among other health damages. Curitiba is abig state capital in Brazil, with weather similar to European cities asManchester, and comparable traffic.Therefore, this research aimed to quantify the contribution of the automotivesources to PM2.5 emissions, evaluate the possible health effectsover the people exposed next to a residential area in Curitiba, andcontextualize the environmental and toxicological perspective of air pollutionas part of a larger project involving seven state capitals in Brazil. PM2.5samples were collected daily from 2008-2012 and then analyzed by Gravimetry,X-Ray Fluorescence and Black Carbon analysis. The enrichment factor (EF), and absoluteprincipal component analysis (APCA) were applied to discriminate the sources ofPM2.5, moreover, the carcinogenic risk probability was performed toaccess the health risks of PM2.5 pollution on the population. Allthe analyzed elements, except those from the soil, were enriched, showing thehigh level of anthropogenic activity in the city. APCA indicated the principal sources as vehicular (60%),soil, industrial and aerosol formation.For the other Brazilian capitals cities, it was found that the vehicularemissions contributed with 40% in São Paulo, 50% in Rio de Janeiro, 17% inRecife and 35% in Porto Alegre. The partial results for Manaus show a massconcentration of about 11 µg.m-3 for dry season, which wouldrepresent a decrease of 0.65% in life expectancy for the local population.While, in Curitiba it was found a mass of 12 µg.m-3 and a decreasein life expectancy of 1.5%. The carcinogenic riskprobability for Cr over all the period studied were 4x10-5. Theseresults indicate that the vehicles are the major source of pollution at theBrazilians urban area. Furthermore, even being the observed concentrations inCuritiba low in the context of the other studied cities, it can cause injure tohuman health. These data also could support efforts to control air pollutionregarding environmental policies.

P4.42 - EVALUATION OF THE HEALTH BENEFITS OF REDUCTION OF AIR POLLUTANTS FROM RESIDENTIAL SECTOR IN ASIAN REGION

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Air pollution by PM2.5 has become a severe social problem in Asian countries in recent years. Residential sector is main emission source of air pollutants, especially for primary and secondary particulate matters in developing countries.

Air pollutants from residential sector also cause a severe indoor air pollution, which brings a largest environmental risk on human health around the world. Therefore, it is necessary to estimate the impact of current emission from residential sector quantitatively, and evaluate the benefits of countermeasures to reduce the emission in residential sector.

In this study, the emission estimation model of the air pollutant from the residential sector in Asian countries was developed. Then, coupled with other emission source, such as industrial, transportation, biomass burning and natural source, the contribution of residential sector in the concentration in Asian region was calculated using WRF and CMAQ model. The simulation was performed for one year of 2012 and exposures to PM2.5 and ozone were evaluated for an estimation of health impact. We considered several countermeasure to reduce residential emission, such as fuel conversion from solid to gas or electricity, use of high efficient cooking stove. Finally, the health impact were estimated using similar method of Global Burden of Disease (WHO). Estimated premature death due to residential emission is about 205,000 in whole Asian region, and it is about 26.6% of total premature death due to ambient air pollution.

P4.43 - THE INFLUENCE OF MANAUS PLUME ON THE AEROSOL PROPERTIES AND IN THE CO AND O3 CONCENTRATIONS

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The Amazon Basin may be the only tropical continental region where there is the possibility to find, at times, nearly pristine aerosol particles free of direct anthropogenic influences. Aerosol sources located within the Amazon Basin are dominated, with the exception of some urbanized areas, by natural and anthropogenic emissions from the biosphere. With biomass burning, the regional energy balance is changed because the high particle concentrations affect the amount and distribution of solar radiation that reaches the surface. Simulations using regional climate models showed that the changes in the energy balance significantly influence regional patterns of atmospheric circulation and meteorology. The GoAmazon project takes advantage of the city of Manaus in the setting of the surrounding green ocean as a natural laboratory for understanding the effects of present and future anthropogenic pollution on the aerosol life cycle in the tropics. The distinct Manaus plume provides an ideal setting for a mechanistic evaluation of anthropogenic perturbations to aerosol properties in pristine areas, an interaction that characterizes the modern era and, following demographic trends, is projected to be more important in the future. We present here preliminary results of compounds typically found in urban emission of large cities, such as CO and O3 as well as some important properties of atmospheric aerosols, as particle number concentration and scattering, measured during events when the urban plume of Manaus was over the experimental site GoAmazon-T2, located 20 km downwind of Manaus, Brazil. The results show [O3] concentration of the order of 20 ppbv and of [CO] up to 2500 ppbv during peak hours 16-18 UTC, for which the particle number concentration reaches large values, as high as 25000 #/cm3. Simultaneously, we observed concentrations of black-carbon in the order of 5 μg/m3 and scattering near 20Mm-1. These results indicate strong influence of the Manaus pollution plume on the aerosol optical properties with important effects to local energy balance.

P4.44 - PM2.5-BOUND POLYCYCLIC AROMATIC HYDROCARBONS IN AN AREA OF RIO DE JANEIRO, BRAZIL IMPACTED BY EMISSIONS OF LIGHT-DUTY VEHICLES FUELLED BY ETHANOL-BLENDED GASOLINE

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Fuel composition determines the polycyclic aromatic hydrocarbon (PAH)profile and the diagnostic ratios of isomers. The most commercialisedautomotive fuels in Brazil are gasohol, ethanol and diesel and, to a minorextent, compressed natural gas (CNG). Many PAHs are regarded as priority pollutantsby both the United States Environmental Protection Agency and the EuropeanCommunity. However, no standard currently exists in Brazil for PAHconcentrations in ambient air. Additionally, there is no legislation regardingfine particles (PM2.5), and monitoring was only recently initiatedin some locations characterised as having critical air quality conditions. Theaim of this study was to characterise the PM2.5-bound polycyclicaromatic hydrocarbon (PAH) concentrations and their diagnostic ratios in anarea impacted by light-duty vehicles fuelled by neat ethanol andethanol-blended gasoline. Samples were collected using a high-volume sampler,extracted, and analysed for all 16EPA-priority PAHs using gas chromatography/mass spectrometry (GC/MS) following the EPA 3550BMethod. The analysedcompounds were naphthalene (NAF), acenaphthalene (ACY), acenaphthene (ACE),fluorene (FLU), phenanthrene (PHE), anthracene (ANT),fluoranthene (FLT), pyrene(PYR)., benz[a]anthracene (BaA), chrysene (CRY), benzo[b]fluoranthene(BbF),benzo[k]fluoranthene (BkF), benzo[a]pyrene (BaP), indeno[1,2,3-c,d]pyrene(IND), dibenz[a,h]anthracene (DBA), and benzo[g,h,i]perylene (BgP). The most abundant PAHs were those with 4-5 rings,mainly PYR, BaA, CRY, and BbF. The total mean concentration was 3.804±2.875 ng m-3, and the contribution of carcinogenic species was 58±16% of the total PAHs. The cumulative health-hazard from the PAH mixture was determined, and the carcinogenic equivalents(CEQ) and mutagenic equivalents (MEQ) were 0.80 ± 0.82 and 1.17 ± 1.04 ng m-3,respectively. Diagnostic ratios and normalised ratios were calculated for the individualsamples. The three most useful diagnostic ratios seemed to be theIND/(IND+BgP), BaA/(BaA+CRY) and FLT/(FLT+PYR) ratios. The mean values were0.40± 0.12; 0.61 ±0.11, and 0.26 ± 0.18, respectively. The PAH ratios determined in this work maybe considered characteristic of gasoline and ethanol fuels and they may be of interest in the future, as ethanol- and methanol-blendedgasolines are becoming increasingly used worldwide.

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P4.45 - SPARTAN: AN EMERGING GLOBAL AEROSOL NETWORK

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For many regions around theworld ground-based observations of fine particulate matter (PM2.5)have insufficient spatial coverage to assess long-term health impacts. Althoughsatellites offer a promising avenue to enhance spatial coverage, there arelimitations and outstanding questions about the accuracy and precision withwhich ground-level aerosol mass concentrations can be inferred from satelliteremote sensing. We have initiated a globalnetwork of ground-level monitoring stations designed to evaluate and enhancesatellite remote sensing estimates in health effects research and riskassessment. This Surface PARTiculatemAtter Network (SPARTAN) is an emerging global federation of ground-levelmonitoring stations that provide hourly PM2.5 estimates in highlypopulated regions. Each station is collocated with an existing ground-based sunphotometer to measure aerosol optical depth (AOD). SPARTAN filters are analyzedfor total PM2.5mass, black carbon, water-soluble ions and metals. Athree-city pilot study has shown good agreement between SPARTAN air filters andthe nephelometer. The network has now expanded to stations spread over fourcontinents. Participating groups include those in Bangladesh, Brazil, Canada, China,India, Indonesia, Israel, Philippines, Nigeria, Vietnam, and the United States.This presentation will describe our recent aerosol and chemical speciationresults and the implications for global PM2.5 concentrations.

P4.46 - THE FUTURE OF FINE PARTICULATE MATTER IN EUROPE: HEALTH IMPACTS AND LEGAL COMPLIANCE

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Long-term exposure to fine particulate matter (PM2.5)has been shown to have significant negative impacts on human health. Duringrecent years, many European cities have seen improvements in air quality thanksto increasingly tight emission control legislation. Nonetheless, legalstandards are exceeded widely, and current levels of air pollution shorten thestatistical life expectancy of European citizens by several months.

The GAINS integrated assessment model calculatesdifferent impact indicators for PM2.5 from bottom up emission anddispersion modelling: Premature mortality with shortening of life expectancy asquantitative metric is calculated from population exposure to PM2.5on a 7×7 km grid using epidemiologically-derived health impact functions. Inaddition, a station based downscaling scheme has recently been added to GAINSwhich estimates PM2.5 concentrations at more than 1850 air qualitymonitoring stations located across Europe in diverse environments ranging fromremote background locations to inner urban street canyons. While the ultimateaim of air pollution legislation is the reduction of pollution inducedmortality, legal standards are tied to measured concentrations at individualmonitoring stations. Presently, a target value of 25 µg/m3 annualmean PM2.5 is in place. For comparison, the WHO standard is 10 µg/m3annual mean PM2.5.

We here undertake acomparison of these different aspects of the PM2.5 pollutionproblem. We assess for the current situation as well as for the future theattainment of EU and WHO air quality standards for PM2.5 in Europe andquantify the loss of life expectancy resulting from exposure. For the future,we discuss emission scenarios used in the ongoing revision of the EU airquality legislation. The baseline case assumes political stagnation atcurrently agreed legislation. While air quality improvements are expected, theWHO standards will not be attained in many regions under this scenario. Inaddition, we quantify the potential benefits of further emission reductionsthat may be achieved by implementing currently available emission controltechnologies to the maximal extent possible.

P4.47 - GEIA'S VISION FOR IMPROVED EMISSIONS INFORMATION

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Accurate, timely, and accessibleemissions information is critical for understanding and making predictionsabout the atmosphere. We will present recent progress of the Global EmissionsInitiAtive (GEIA, http://www.geiacenter.org/),a community-driven joint activity of IGAC, iLEAPS, and AIMES within theInternational Geosphere-Biosphere Programme. Since 1990, GEIA has served as aforum for the exchange of expertise and information on anthropogenic andnatural emissions of trace gases and aerosols. GEIA supports a worldwidenetwork of emissions data developers and users, providing a solid scientific-foundation for atmospheric chemistry research. By the year 2020, GEIA envisionsbeing a bridge between the environmental science, regulatory, assessment, policy,and operational communities. GEIA's core activities include 1) facilitatinganalysis that improves the scientific basis for emissions data, 2) enhancingaccess to emissions information, and 3) strengthening linkages within the internationalemissions community. We will highlight GEIA's current work distributingemissions data, organizing the development of new emissions datasets,facilitating regional emissions studies, and initiating analyses aimed atimproving emissions information. GEIA welcomes new partnerships that advanceemissions knowledge for the future.

P4.48 - EXPLORING THE SEVERE WINTER HAZE IN BEIJING

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Extreme haze episodes repeatedly shrouded Beijing during the winter of 2012–2013, causing major environmental and health problems. To better understand these extreme events, we analyzed the hourly observation data of PM2.5 and its major chemical composition, with support of model simulations. Severe winter haze was shown to result from stable synoptic meteorological conditions over a large part of northeastern China, rather than from an abrupt increase in emissions. Build-up of secondary species, including organics, sulfate, nitrate, and ammonium, was the major driving force behind these polluted periods. The contribution of organic matter decreased with increasing pollution level while sulfate and nitrate contributions increased. Correspondingly, the ratio of secondary organic carbon to elemental carbon decreased and had a stable diurnal pattern during heavily polluted periods, indicating weakened photochemical activity due to the dimming effect of high loading of aerosol particles. Under such conditions, the strong increase in sulfate and nitrate contributions to PM2.5 was attributed to an elevated conversion ratio,reflecting more active heterogeneous reactions with gradually increasing relative humidity. Moreover, we found that high aerosol concentration was a regional phenomenon. The accumulation of aerosol particles in Beijing and other southeast cities paralleled each other. The 'apparent' sharp increase in PM2.5 concentration of up to several hundred μg m-3 per hour recorded in Beijing represented rapid 'recovery' from an 'interruption' to the continuous pollution accumulation over the region, rather than purely local chemical production. This suggests that regional transport of pollutants played an important role during these severe pollution events.

P4.49 - INVESTIGATING THE CONCENTRATION AND CHEMICAL CHARACTERIZATION OF PM10 AT WESTERN PART OF ISLAMABAD

Gufran Bulbul

Pakistan, during the last decade,has seen an extensive rise in population growth, urbanization, and industrialization, together with a great increase in motorization and energy use. As a result, rise has taken place in the emission of various air pollutants. However, due to the lack of air quality management, the country is suffering from deterioration of air quality. The Government has taken positive steps toward air quality management in the form of the Pakistan Clean Air Program and has recently established a small number of continuous monitoring stations.. Industrial pollution, suspended particulates,indoor air pollution, and increasing motorizing were reported as key sources affecting ambient air quality in the country (Pak-EPA 2005) .Many pollutants are contributing to the air pollution but the most important one is the particle pollutants or particulate matter. Particulate matter is the most harmful air pollutant among all categories of pollutants Atmospheric particulate matter is a complex mixture of elemental and organic carbon,ammonium, nitrates, sulphates, mineral dust, trace elements, and water. PM10 is the designation for particulate matter in the atmosphere that has an aerodynamic diameter of 10μm or less. Currently there is no accurate data available on the particulate matter concentration in different cities of Pakistan. Almost 45 percent of beds in hospitals are occupied by patients with diseases related to dust pollution in Pakistan. The current interest in atmospheric particulate matter (PM10) is mainly due to its effect on human health and its role in climate change. PM10 concentration will be measured at different sites of NUST H-12 and Kashmir Highway Islamabad using High volume air sampler an Air sampling equipment capable of sampling high volumes of air at high flow rates (typically 1.13 m3/min or 40 ft3/min)over an extended sampling duration .The sampling period will be of 24 hour.Each sample filter will be weighed before and after sampling to determine the net weight (mass) gain of the collected PM10 sample Next step will be the chemical characterization. Element concentrations will be determined by energy dispersive X-ray fluorescence (ED-XRF) technique. SO by this study we will going to find first the exact concentration of PM10 and than its chemical characterization and finally fining a relationship between the chemicals and their respective sources.

P4.50 - NEW INSIGHTS OF PARTICULATE AND GASEOUS EMISSIONS TO THE COMBINATION OF BIODIESEL BLENDS AND THE SELECTIVE CATALYTIC REDUCTION (SCR) AFTER-TREATMENT SYSTEM

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Variations in the chemical composition of fuels and biofuels incombination with novel emission control systems bring new insights to the investigationof regulated and unregulated combustion emissions. The main goal of the presentinvestigation was to characterize the emission of particulate matter andgaseous compounds by means of biodiesel and diesel from vehicles equipped withSelective Catalytic Reduction (SCR) systems. A dynamometer tests bench was usedwith a diesel engine equipped with urea-SCR operating with Low-Sulfur Diesel(LSD), Ultra-Low-Sulfur Diesel (ULSD) or with a blend of 20% soybean (B20). Forthe gaseous phase, the aim was to quantify mainly NOx, NH3,N2O by FTIR and these results were used to perform the AERMODdispersion model analysis on each compound for the city of Curitiba. The healthrisks of the target compounds were assessed using the Risk AssessmentInformation System. Gravimetric analyses were performed on segregatedparticulate matter. Soluble ions, PAH´s and Nitro-PAH´s, elementarycomposition, black carbon, and the molecular reactivity of soot were analyzed usingIC, GC-MS, EDXRF, Aethalometer, and Micro-Raman, respectively, for the totalparticulate fraction. The results showed that, to all studied gaseous compounds,the emissions of B20 were always in lower concentration than using just ULSD. Forall fuels, SCR significantly increased the concentrations of NH3 andN2O. When the AERMOD and RAIS were performed, only NH3indicated significant chronic non-cancer risk (205 in a million inhabitants). Thegravimetric analyses have shown that the combustion of ULSD generates more fineparticles compared to the other fuels. Among all tested combinations, SCR+B20 promotesthe higher reduction of major ions particles. The results didn't showsignificant difference for elemental concentrations and optical propertiesconcerning the fuel and SCR system combinations. The higher and lowerreactivity were observed for ULSD exhaust particles and B20 samples,respectively. The PAH's and Nitro-PAH's concentration are dependent of fuelcomposition and after-treatment system. The results are interpreted separatelyand as a whole with the specific aim of identifying compounds that could affectthe human health and the environment.

P4.51 - PREDICTIONS OF CHEMICAL WEATHER IN ASIA: THE EU PANDA PROJECT

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P4.52 - EMISSIONS OF NONMETHANE VOLATILE ORGANIC COMPOUNDS FROM OPEN CROP RESIDUE BURNING IN YANGTZE RIVER DELTA REGION, CHINA

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Open crop residueburning is one of major sources of air pollutants including the precursors of photo-oxidantsand secondary organic aerosol. We made measurements of trace gases including nonmethanevolatile organic compounds (NMVOCs) in Rudong, a rural area of Central EastChina, in June 2010. During the campaign we identified six biomass burning eventsin total by the simultaneous enhancements of carbon monoxide and acetonitrile. Fourcases represented fresh smoke plumes, and two cases represented aged plumes.While we were not able to quantify formaldehyde, formic acid, and methanol, weidentified the enhancement of other oxygenated volatile organic compounds (OVOCs)as well as low-molecular alkanes and alkanes, and aromatic hydrocarbons inthese plumes. Based on the data in the fresh plumes, we calculated the emissionfactors (EFs) of individual NMVOCs, and found that the EFs of ethene,acetaldehyde, acetone/propanal, acetic acid, ethane, and propene are greaterthan 1 g/kg. The EFs of acetaldehyde, acetone/propanal, and acetic acid showedthe dependence on air mass age, even in smoke plumes of photochemical age lessthan 2 hours, supporting that these species are rapidly produced during plumeevolution. Finally we suggest that open burning of residue of wheat (all crops)in China releases at least 0.29 Tg (1.95 Tg) NMVOCs annually. The EFs ofspeciated NMVOC can be used to improve the existing inventories.

P4.53 - IMPROVING THE VIEW OF AIR QUALITY FROM SPACE: CURRENT FINDINGS AND FUTURE DIRECTIONS FOR ANALYSIS OF DISCOVER-AQ OBSERVATIONS

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It has now been four years since NASA selected the first series of Earth Venture airborne science projects. As one of those projects,DISCOVER-AQ (Deriving Information on Surface conditions from COlumn and VERtically resolved observations relevant to Air Quality) has aimed to study the distribution of gaseous and particulate pollution in the lower atmosphere over contrasting regions of the U.S. that are currently in violation of National Ambient Air Quality Standards. In August 2014, DISCOVER-AQ will have completed its fourth and final deployment, rounding out a dataset of detailed observations over Maryland (Baltimore-Washington corridor), California (southern San Joaquin Valley), Texas (Greater Houston area), and Colorado(Denver/Northern Front Range). The DISCOVER-AQ observing system implemented in each of these areas included two aircraft and a ground network to represent concurrent views of air quality conditions from multiple perspectives. The ground perspective, anchored by local air quality networks,represented the detailed but spatially-limited view available to regulators. These ground networks were augmented by lidars, balloons, and passive remote sensors to enhance the connection between conditions observed at the surface and aloft. From above, a King Air flew at 8 km throughout the day with downward looking remote sen-

sors to approximate the type of information that would be enabled from the perspective of a geostationary satellite. Below the King Air, a P-3B profiled above ground sites to provide in situ measurements of the detailed vertical structure in pollutants that is critical to linking column-integrated satellite observations with surface air quality conditions. This presentation will include information contrasting the conditions encountered during each deployment and discuss how they are being used to test and improve satellite retrievals and air quality models as well as define observing networks to best support future geostationary observations of air quality.

P4.54 - IMPACT OF MINERAL DUST ON THE MENINGITIS INCIDENCE IN WEST AFRICA: WHAT CAN BRING THE CALIPSO MISSION?

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This paper presents the use of CALIOP aboard CALIPSO (Winker et al., 2009) lidar observations for assessing the frequency and intensity of dust outbreaks in West Africa with a focus on the so-called meningitis belt defined by Lapeyssonie (1963). This belt extends between Senegal and Ethiopia on a 10°-15° North latitudinal band. Mineral dust is one of the important environmental risk factor for meningitis epidemics in this area. Indeed, during Saharan dust intrusion (Harmattan) in the dry season, the dust combined with extremely dry air are suspected to damage the pharyngeal mucosa, thereby easing bacterial invasion (Mueller and Gessner, 2010). (Martiny and Chiapello,2013) have shown that a dust peak with a 0-2 week lead-time precedes each meningitis peak in Niger and Mali. Monitoring dust concentration close to the ground level from space remains a challenging issue. The CALIOP 5km vertical feature maskand layer products are used to produce a short climatology of the altitude and optical depth of the lowermost dust layer during the dry season from 2007 to 2013. Satellite retrieved extinction coefficients are compared to in situ ground-level PM10 data at specific sites in Mali, Burkina-Faso and Niger. Satellite products are then analyzed with regards to the weekly number of cases in meningitis (WHO database).

P4.55 - INVERSION OF AEROSOL SOURCES OVER THE SAHARA DESERT USING SATELLITE OBSERVATIONS

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Aerosols play a key role in the climate system, having impacts on biogeochemical cycles, clouds and radiation. Modeling studies are a useful tool to estimate these aerosol effects and their uncertainties. Part of the reliability of these modeling studies depends however on the accuracy of the aerosol sources estimates, the magnitude and variability of which are still highly uncertain on the global, regional and local scales. In this study we expect to contribute to the development of more accurate aerosol emission mapping to be used in modeling studies. An inversion system exists that estimates, at the global scale, the monthly emissions of the main aerosol species, namely sulphur dioxide (SO2), black carbon (BC), particulate organic matter (POM), desert dust (DD) and sea salt (SS). These emissions are estimated for each species over a set of predefined regions by assimilating aerosol optical depth into a global aerosol model of intermediate complexity (SPLA). We will expand this system to estimate the emissions on a regional scale and apply it at first over the Sahara desert for a one-year period. With the current global system, the estimated fluxes for the Sahara desert from the inversion system at the global scale (~900 Tg/yr) were within the range of emissions from the AeroCom models (400-2200 Tg/yr). In this work, we will use the zoom capability of the LMDz model and a new parameterization of gust winds along with the assimilation of MODIS AOD products, in order to optimize key parameters in the dust emission parameterizations over the Sahara desert. We expect improvements in the temporal and spatial variability of dust emission inventory over the region of interest. We will show preliminary results of this assimilation procedure in terms of emission fluxes and its impact on simulated AOD in comparison to AERONET AOD observations.

P4.56 - ASSESSING THE MIXING STATE AND REACTIVITY OF BLACK CARBON CONTAINING AEROSOL PARTICLES

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Knowledge of the mixing state of black carbon (BC) particles is essential for understanding their impact on both climate and human health. A variety of experimental techniques has demonstrated that particulate BC can be internally mixed with other constituents,the degree of which is very much related to the amount of chemical and physical atmospheric processing the particles have experienced. Of particular importance is the extent to which BC from vehicular emissions is coated with hydrocarbon-like materials. To address this uncertainty, we have deployed a new instrument – the Aerodyne Soot Particle Aerosol Mass Spectrometer (SP-AMS) – in two urban settings in Toronto, one beside the roadway and one removed from roadways. As well, we have operated the SP-AMS indifferent modes, including one where the composition of single aerosol particles is analyzed and one which measures the composition of individual vehicular aerosol plumes. We will present results that describe the degree to which particles are internally mixed, emphasizing the quantitative nature of the SP-AMS measurements. To place this work into context, the reactivity of BC particles has also been assessed in the lab using the SP-AMS. The reactivity of BC particles to gas-phase ozone and their ability to participate in redox cycling reactions will be presented for both coated and uncoated particles.

P4.57 - ESTIMATING A SECONDARY INORGANIC AEROSOLS BUDGET AT GLOBAL, EUROPEAN AND FRANCE SCALE WITH MOCAGE

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MOCAGE is a tropospheric and stratospheric chemistry transport model used for research at CNRM (Météo-France). MOCAGE is able to run at different scales by using up to four nested grids. The standard configuration that we use has three domains: a global scale domain at a resolution of 2°x2° longitude by latitude; a continental scale domain (covering the European Union) at 0.5°x0.5°; and a regional scale domain (over France) at 0.1°x0.1°.

Aerosols are represented using a sectional approach. Up to now, only four primary aerosols were modelled: sea salt, desert dust, black carbon and organic carbon. Recently secondary inorganic aerosols have been implemented in the model. It is now able to represent the evolution of nitrate, sulphate and ammonium within aerosols. Each aerosol type is represented with six size bins.

The nested grids allow us to treat all the scales with a unique model.The aim of this study is firstly to examine the secondary inorganic aerosol budget and secondly their feedback on the gaseous pollutants.This is done through a synergetic analysis of the global, continental and regional scales. Air quality issues are analysed only at the regional scale.

This study also focuses on the origin of the different pollution sources at the continental and regional scales. In particular, we quantify the local sources and those that are imported or exported.

MOCAGE is also used for daily operational forecast in the framework of theFrench PREV'AIR project and the MACC-II program. This new version ofthe model that includes secondary inorganic aerosols is aimed to be a significant upgrade for these programs.

P4.58 - REGIONAL AIR POLLUTION PROBLEM IN BEIJING-TIANJIN-HEBEI AND SURROUNDING AREAS IN CHINA

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In the past 30 years, China has undergone great economic improvements, leading to increasing urbanization and expanding city and megacity clusters. However, the city expansion has also resulted in a series of environmental problems. Beijing-Tianjin-Heibei Region in NorthChina Plain is one of the largest city clusters in China. With high population density and energy consumption rate, this region is suffering from severe air pollution and regional haze problem and the unbalanced regional development pattern has also increased difficulty of air quality improvement. According to estimation of the Models-3 Community Multiscale Air Quality (CMAQ) Modeling System, the average contribution of PM2.5 in Beijing cities areas from surrounding regions is 44% in winter and after emissions in the Beijing-Tianjin-Hebei and surrounding regions of the main pollutants are cut down for 30~40%, PM2.5 average concentration inBeijing city area deceases by 24.8±2.1%. These results imply that regional cooperation is important in air quality management in Beijing-Tianjin-Hebei Region and financial assistance from developed region to developing regions maybe one effective way in solving the problem.

P4.59 - CLIMATOLOGY OF TOTAL OZONE COLUMN OVER SÃO PAULO

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The aim of this study was to analyze the climatologyof total ozone column (TOC) over São Paulo city (23.53°S; 46.62°W). Daily dataobtained from the database of TOMS (Total Ozone Mapping Spectrometer) on boardNimbus-7 and Earth-Probe satellites available for the period 11/02/1978 to 05/06/1993and 07/27/1996 to 12/12/2005, respectively and OMI (Ozone MonitoringInstrument) on board Aura satellite, with data available from 10/01/2004 to03/12/2014, were analyzed. The seasonal variability in TOC could be wellobserved throughout the period: low values in summer, ascending values fromautumn, presenting maximum peak during the spring season. No significant trendwas observed. The extreme values ??for the entire study period was217 DU and 350 DU on 09/20/1991 and 07/19/1992, respectively. Between 1978 and 1985,daily values ??of total ozone over São Paulo were on average of 275 (± 15) DU.From 1985 to 1993 this amount decreased to 271 (± 16) DU. In this period therewas a slight negative trend in the daily variation of ozone. From 1996 to 2004,these daily mean values ??were reduced to 270 (± 16) DU and between 2004 and 2014were further reduced to 262 (± 13) DU.

P4.60 - LONG-TERM MEASUREMENTS OF CARBONACEOUS AEROSOL AT CAPE HEDO, OKINAWA JAPAN: ANALYSES OF THE EFFECTS OF CHANGES IN EMISSIONS IN EAST ASIA

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ElementalCarbon (EC) (or Black Carbon (BC)) is attracting much attention, recently,because it is considered as the second largest contributor to global warming. ECis one of the SLCP (Short Lived Climate Pollutants) and is emitted from coalcombustion, diesel exhaust, biomass burning, etc.

Recently, several observatories were established toinvestigate the long-term effects of aerosols on climate in East and South Asiaunder the Atmospheric Brown Cloud (ABC) project. We conducted observations atthe Cape Hedo Atmosphere and Aerosol Monitoring Station (CHAAMS) in Okinawa,Japan, which is assigned as oneof major sites of ABC-Asia. We investigated the effects of the change ofcarbonaceous aerosol source emission on the basis of EC/PM2.5 ratio.

Organiccarbon (OC) and EC were measured at CHAAMS from 2004 to 2013. We measured ECand OC in two methods. The first one is to use a carbon monitor (RP5400) at 3-hoursintervals for 2004-2011. The second one is to collect particulatematter on filters and analyze them using the thermaloptical methodunder the IMPROVE protocol since 2010. The annual trend of EC from 2004 to 2008 was not clearly: from 0.35 μgC/m3 to 0.37 μg C/m3. The annual trend of OC from 2004 to 2012 was slow downwardone from 1.8 μg C/m3 to 1.1 μgC/m3. The OC concentration decreased by 59 %. The annual average ofOC/EC ratio showed a downward trend from 5.0 to 2.6 from 2004 to 2010.

Theresults were compared with the emission inventory such as REAS 2. REAS 2pointed out that the OC emission has decreased since 2006 because the emissionfrom crop residues and fuel woods burning decreased, while the EC emission hasincreased since

2000. Amount ofSO2 emission in China has also decreased since 2006 because desulfurizationequipment became widely used in China. The trend of EC/PM2.5 ratio from2004 to 2010 showed the rising trend from 2.7 to 5.0 because of the decrease ofsulfate and OC concentrations in PM2.5. It implies that the upward trendof EC/PM2.5 ratio may affect the changing of positive positive radiativeforcing.

P4.61 - STUDY OF RELATIONSHIP OF AIR QUALITY AND METEOROLOGICAL VARIABLES ON THE OCCURRENCE OF CIRCULATORY AND RESPIRATORY MORBIDITY IN METROPOLITAN AREA OF SÃO PAULO – BRAZIL.

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This study aims to evaluatethe relationship between air pollution and human health, focusing on the MetropolitanRegion of São Paulo (MASP). Over 19 million inhabitants and numerous sources ofair pollutants, especially for motor vehicles, pollution levels in the regionare high, and as consequence the occurrence of adverse health effects is common.In this sense, the study emphasized the relationship between health and theconcentrations of ozone, airborne particulate matter, air temperature andrelative humidity. The authors conducted a study using monthly data forhospital admissions for respiratory diseases and cardiovascular diseases forseniors and children and andair quality data from MASP air quality network, in the period2008-2011. The association between air pollution and effects on human healthwas determined by generalized linear models for Poisson regression. It wasfound that the highest mean number of hospitalizations occurred for circulatorydiseases in the elderly, followed by respiratory diseases in children. Thenumber of hospital admissions was higher during the winter period, howeverthere was a good distribution throughout the study period. Considering thepollutants analysed, only ozone showed significant correlation with hospitaladmissions for circulatory diseases. Considering the 3 stations analysed,the national pattern of air qualitywas exceeded on 218 days for ozone, particulate matter concentrations remainedwithin the normal concentrations. The year 2010 proved to be asignificant factor in hospital admissions in the elderly, since it showed aboveaverage climatic factors, highlighting the importance of considering meteorologicalvariables in health studies. It is expected that the development of the studycan serve as a basis for the improvement of public policies to control airquality and also as a warning to the deleterious human health effects in theMASP.

P4.62 - ON THE CHALLENGES FOR IMPROVING AIR QUALITY IN SOUTH AMERICAN MEGACITIES

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Vehicularemissions are the main source of emitted pollutants in South Americanmegacities. The accelerated urbanization process produced a disorganized urbansprawl that went out of control by land-use and land-cover policies. As citiesexpand, the time spent in travel increases and so do vehicular emissions. Inthis study, we evaluate the transpor-

tation systems for six important megacitiesof South America and point out the main major advances and retreats that havecontributed to improve or deteriorate air quality in such cities: Buenos Aires,Bogotá, Lima, Rio de Janeiro, Santiago and São Paulo. Results indicate that,for most cities, the failure to provide adequate solutions for publictransportation in a planned manner is the main cause of air quality deterioration.The implementation of clean, non-motorized transport modes, namely walking andcycling, face challenges associated with deficient infrastructure includingpavement, sidewalks, signaling and lighting, as well as with being unsafe. Inrelation with public transportation systems, the development of mechanisms ofphysical integration among different forms of transportation with the offeringof comfort and safety for passengers is mandatory. The implementation of BRT(Bus Rapid Transit) system in Bogotá was observed to be a good example ofsuccess of such policies. In the opposite direction, two badly formulatedpublic policies can be highlighted. Firstly, the liberalization of thetransport system (freedom of routes and tariffs), generating a collapse in thepublic transportation system of Lima, with approximately 140,000 taxis,representing 60% of the whole collective transport, being the main cause of theunusually high levels of air pollution. Secondly, Brazilian governmentalpolicies that facilitate the credit access to buy vehicles has crowded theroads and drastically reduced the number of passengers per km and average speedin the São Paulo public transport bus operation. There are six times moreprivate cars on streets of São Paulo than of Bogotá. This study suggests thatthe best way to control air pollution in megacities of South America isproviding integrated, comfort and safety public transportation system.

P4.63 - THE PISAC INITIATIVE: POLLUTION AND ITS IMPACT ON THE SOUTH AMERICAN CRYOSPHERE

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Recentscientific evidenceindicates that the Andean and Patagonian glacial regions have already shown the impactsof rapid climate change with receding glaciers andsnow cover.Andean glaciers and snow fall constitute the most important source of freshwater for countries along the western coast of South America. Thus glacierretreat and changes in snow fall could have potentiallylarge implicationsforwater resources and local agriculture, especially for local indigenous populations living in high altitude communities aswell as for large urban centers at relatively lower surroundingaltitudes.

PISAC(Pollution and its Impact on the South American Cryosphere) was created by ateam of multidisciplinary scientists and policy experts in the regionssurrounding the Andes, as well as international experts. The overall goal of this initiative is to investigatekey sources and impacts of black carbon and co-pollutant emissions in theAndean regions, aiming at designing research activities to close knowledge gapsand to address mitigation measures for near-term climate protection and airquality improvement. The broad spectrum of experts and the inclusion ofrepresentatives from eight countries permit taking into account the diversityof the region.

This presentationwill give an overview of the PISAC initiative, and the activities currentlyundertaken by the participating members, including emissions, measurements,modeling and policy implications.

P4.64 - AMMONIA EMISSION REDUCTION IN FOUR STROKE MOTORCYCLES. A REVIEW OF RECENT RESEARCH WORKS.

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Automotive emissions limits have been consistently reduced in the world due to environmental demands. In order to comply with the introduction of those new limits, vehicles have been equipped with electronic injection systems and three-way catalytic converters for emissions abatement. Nevertheless, these converters produce other unwanted by products pollutants, such as the formation of ammonia.

Once emitted in the air ammonia contributes to increase the PM2,5 mass fraction, with known negative health effects.

A joint venture between academia, applied research institute and the industry was formed to investigate the reduction of the ammonia formation in catalytic converters in motorcycles. The main results of cited joint venture will be summarized in this paper.

The first part of the research was focused on the ammonia formation process inside the catalyst in order to understand and explain the formation process. A large set of laboratory measurements was necessary. Conventional and Flex Fuel Motorcycles were tested and fuelled with different gasoline/ethanol blends. Ammonia, together with other regulated (HC, CO, NOx) emissions was measured by using both, conventional and FTIR techniques.

The second part of the research was focused on the development and test of a catalyst in order to reduce ammonia emissions. Based on the previous researches (first part), a new SCR catalyst was developed and produced by the manufacturer. The catalyst was installed and a set of new tests was conducted.

At the moment the research works continue and a new catalyst has been developed and produced. This new unit is very compact and has been installed in a motorcycle. Tests are on the way at the moment and preliminary results will be presented at the IAG 2014 Congress together with a summary of the main results obtained for the cited joint venture research group.

P4.65 - MEASUREMENTS OF PARTICULATE MATTER IN AN URBAN ENVIRONMENT USING A MOBILE PLATFORM

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Pedestrians in urban areas are usually exposed to dangerous levels of air pollution on their usual daily commuting routes. Although some cities have fixed stations to monitor air pollutants, they do not reflect the reality of the pedestrians, since air pollution shows large spatial fluctuations and depends on traffic conditions, meteorological settings and the urban attributes. This way, mobile platforms are better suited for urban air pollution studies since they can provide a finer spatial coverage of the pollutants concentrations and, thus, can better assess the patterns of personal exposure to pollutants. This study was carried out in Londrina (a mid-sized city in southern Brazil) and employed a mobile platform mounted on a bicycle to measure the mass concentration of total suspended particles (TSP) along three different routes at peak traffic hours: (1) a 10-km round trip passing by heavily trafficked avenues and residential areas; (2) a central route along one of the city's busiest avenues and (3) a trip through a recreational area adjacent to a lake and busy avenues. The platform was custom built and equipped with a nephelometer for TSP measurement, a GPS for georeferencing, and a temperature and relative humidity sensor. The mean TSP mass concentrations at all circuits show little differences between weekdays (WD) and weekends (WE). For example, we observed mean TSP values of 40 and 36 ug/m3 on WD and WE, respectively along circuit 2, and 29 and 21 ug/m3 along circuit 3. However, the instantaneous concentrations varied greatly and were observed at specific sectors of the transects, directly linked to local variables such as traffic counts, vehicle type (light- or heavy-duty), street's incline, among others. Values as high as 1,777 ug/m3 were observed on circuit 2 linked to discharges from heavy-duty vehicles. With these preliminary results we conclude that some routes should be avoided during peak traffic hours, and others should be avoided altogether. Results from this work have provided new insights into the spatio-temporal variability of particulate matter in the urban environment and pave the way for further research using mobile platforms on air quality, traffic management, and population exposure studies.

P4.66 - THE IMPACT OF URBAN EMISSIONS IN THE SOUTH AMERICA

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A major concernregarding air quality in urban areas is the formation of tropospheric ozone.The urban growth is undoubtedly a concern from the standpoint of public healthin less developed nations, due to high rates of urbanization and its directimpact on air quality and climate on local, regional and globalscales.Therefore, it was proposed to study the regional impact of urbanemissions on air quality and chemical weather forecast over South America usingthe CCATT-BRAMS (Coupled Chemistry Aerosol and Tracer Transport model to theBrazilian developments on the Regional Atmospheric Modeling System). For thispurpose, we worked on the development of an urban vehicle emissions inventoryfor South America, that integrates information from local vehicle emissioninventories using socio-economic data, extrapolation of emissions for citieslacking local inventories, and the geographic distribution of emissions atdifferent spatial resolutions.

Using this inventoryin PREP-CHEM-SRC preprocessor and with extensive work on CCATT-BRAMS model, weshowed that the larger South American cities has a significant influence on theozone production in the surrounding area, and has distinct chemical regimesdepending on their latitude location. Finally, we worked on the generation ofurban emission inventories scenarios for ozone precursors in the period2011-2030. We estimated a reduction in the emission of CO and NMVOC in Braziluntil 2030, associated both with the renewal of the fleet (including thegradual replacement of gasoline by biofuel cars) and the implementation ofeffective emission reduction programs. However, we estimated an increasing ofNOX emissions in the scenario. Regarding to our experiments, the reduction ofNMVOC between 2030 scenario and the base year did not significantly affect the local productionand regional distribution of ozone overthe major cities of South America.

P4.67 - CHARACTERIZATION OF AIRBORNE PARTICLES AND GENOTOXIC EFFECTS FROM CASHEW NUT ROASTING

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Particulate matter (PM) is potentially harmful to health and related to genotoxic events, an increase in the number of hospitalizations and mortality from respiratory and cardiovascular diseases. The present study conducted the first characterization of the morphology, particle size distribution, elemental composition and polycyclic aromatic hydrocarbon (PAH) analysis of PM, as well as the biomonitoring of genotoxic activity associated to artisanal cashew nut roasting, an important economic and social activity worldwide. The morphology, particle size distribution and elemental composition was determined using scanning electron microscopy (SEM) coupled with energy-dispersive x-ray spectrometry. The levels of PM2.5 and black carbon were also measured by gravimetric analysis and light reflectance and PAH analysis was carried out by gas chromatography–mass spectrometry. Genotoxic activity was measured by the Tradescantia pallida micronucleus bioassay (Trad-MCN). Other biomarkers of DNA damage, such as nucleoplasmic bridges and nuclear fragments, were also quantified. In SEM micrographs the particles appeared smooth-surfaced and irregular in shape. The mean amount of PM2.5 accumulated in the filters (Jan 2124.2 μg/m3; May 1022.2 μg/m3; Sep 1291.9 μg/m3), black carbon (Jan 363.6 μg/m3; May 70 μg/m3; Sep 69.4 μg/m3) and concentrations of Al, Si, P, S, Cl, K, Ca, Ti, Cr, Mn, Fe, Ni, Cu, Zn, Se, Br and Pb were significantly higher than the non-exposed area. Biomass burning tracers K, Cl, and S were the major inorganic compounds found. Benzo[k]fluoranthene, indene[1,2,3-c,d]pyrene, benzo[ghi]perylene, phenanthrene and benzo[b]fluor-anthene were the most abundant PAHs. Mean benzo[a]pyrene-equivalent carcinogenic power values showed a significant cancer risk. The Trad-MCN bioassay revealed an increase in micronucleus frequency, 2–7 times higher than the negative control and significantly higher in all the months analyzed, possibly related to the mutagenic PAHs found. This study demonstrated that artisanal cashew nut roasting is a serious occupational problem, with harmful effects on workers' health. Those involved in this activity are exposed to higher PM2.5 concentrations and to 12 PAHs considered potentially mutagenic and/or carcinogenic. The Trad-MCN with T. pallida was sensitive and efficient in evaluating the genotoxicity of the components from cashew nut roasting.

P4.68 - NARROWING THE UNCERTAINTIES ON AEROSOL AND CLIMATE CHANGES IN SÃO PAULO STATE, BRAZIL

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It is recognized thatmegacities have regional and global effects on climate, and that aerosols andGreen House Gases (GHG) constitute the principal tracer of those effects. Suchis the case in the Metropolitan Area of Sao Paulo (MASP), one of the largestmega-cities in the world. MASP has a population of almost 20 millioninhabitants. There is an integrated approach to describe the formation andtransport of aerosols and gases in the MASP, from the local to the globalscale, discussing the feedback among the dif-

ferent compartments and scales. Theproject with funding from the São Paulo Science Foundation, called NARROWINGTHE UNCERTAINTIES ON AEROSOL AND CLIMATE CHANGESIN SÃO PAULO STATE – NUANCE-SPS (Number 2008/58104-8),comprising various subprojects, employ measurements and modeling to studygaseous and particles in the atmosphere: sources; evolution in the atmosphere;formation of secondary particles; deposition; and potential impact on theclimate and human health. NUANCE brings together several research groups fromdifferent institutions from University of São Paulo: IAG, IQ, IF, IGc, FM; andfrom other institutions: CETESB and INPE. It is being used the state-of-the-artinfrastructure considering sampling and atmospheric modeling to investigate therole of aerosol on climate and air quality. The main source of air pollution inMASP is the transport sector. In this region, there are approximately 6.5million passenger cars and commercial vehicles: 85% light-duty, 3%heavy-duty diesel vehicles (diesel + 3% bio-diesel) and 12% motorcycles. Ground-basedand vertical profile measurements are being performed (in situ, ozonesondes andLIDAR). Emission inventory is being elaborated based on the measurements ofemission factors from the vehicular fleet. The formation of ozone and fine particles isbeing modeled with the WRF-Chem (weather and research forecast with chemistry)model and BRAMS (Brazilian Regional Amospheric Modeling System). The influenceof the megacity emission to the concentration of the secondary pollutants isbeing evaluated and correlated to health impacts. The main results are relatedto the estimative of emission factors by the vehicular fleet, the compositionand sources of particles, mainly the fine particles with the characterizationof the metals, carbon compounds and more recently the bioaerosols. The modelingapproach includes a new emission profile distribution and the air qualityforecast is available at http://www.lapat.iag.usp.br/aerossol/wrf9/index.php.

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P4.69 - THE IMPACT OF LOCAL POLLUTANTS EMISSIONS TO THE VERTICAL OZONE PROFILE IN THE METROPOLITAN AREA OF SÃO PAULO.

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The metropolitan Area of São Paulo (MASP) is an urban area characterizedby a high number of vehicles, being more than 7 million in 2013. According tothe local environmental agency (CETESB, Companhia de Tecnologia e SaneamentoAmbiental), more than 80% of the ozone precursors are emitted by the light andheavy-duty vehicles. To understand the process that drives the ozone formationin the atmosphere of São Paulo, photochemical modeling is being performed with WRF-Chem modeling system and B-RAMS. In order to verify the modelingrepresentation of the vertical transport and to understand the physic-chemicalmechanism of formation and transport of ozone in the MASP, experiments withozonesondes have been performed. During the spring 2013, ten ozonesoundes: October 29 (9:13UTC), October30 (16:59UTC, 22:29UTC), November 1st (15:28UTC), November 2(8:13UTC, 12:01UTC, 16:05 UTC, 20:03UTC), and November 3 (0:03 UTC, 11:08UTC) werelaunched in downtown São Paulo (Campo de Marte Airport, 23.51S 46.64W, 722 m/MSL) tostudy the vertical transport and photochemical process involving ozone from thesurface to high levels. The soundings reached more than 32 km high. Themeasured profiles were compared to the simulated profiles obtained by the airquality modeling. The analysis showed a good agreement in higher levels of the-boundary layer representing the formation due to the photochemical process andtransport. During the transport from thesurface to high levels there is a change from a VOC (Volatile Organic Compound)-sensitiveto a more NOx-sensitive regime.

The sources that determine the behavior of tropospheric ozone in the MetropolitanArea of São Paulo are the vehicular emissions of its precursors and mediumrange transport of biomass burning compounds from different regions of SãoPaulo State and occasionally from long range transport from central part ofBrazil. However, backscatter aerosol profiles measured by a Lidar system didn´tshow evidence of transport events in this period.

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P4.70 - ENVIRONMENTAL HEALTH RISK INDICATORS BY EXPOSURE TO AIR POLLUTANTS AND THE PROCESS OF SOCIAL INEQUITY IN THE AREAS BELONGING TO THE METROPOLITAN REGION OF RIO DE JANEIRO

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The Metropolitan Region of Rio de Janeiro is located in a coastallowland surrounded by the Serra do Mar, which rises to 900 meters high onaverage, andis the largest metropolitan region with economic and demographicconcentrationin the country. In this region, is located most state industries,trade andservices. The relief, which affects the atmospheric transport, soareas withdifferent concentrations of pollutants, called air basins. Theconcept ofairshed has been widely used, especially for responsible managementof airquality metropolitan region thus institutions, taking into accounttheinfluences of relief and potentially polluting activities, MetropolitanRegionof Rio de Janeiro was divided into four sub-regions. The selected forthisstudy was the Air Basin region I, although that owns mostproductiveactivities, currently has housed various industrial enterprises largemost insearch of jobs, contributing to the social inequity process. The maingoal ofthis work is the elaboration of the risk map, making use of the areacovered bythe Air Basin I and gets different indicators, capable of providingtheinterrelationship between environment, health and quality of life ofthepopulation who live or work in this sub region.

P4.71 - DETERMINING THE CONCENTRATION OF METALS IN PARTICULATE MATTER (PM2,5 AND PM10) OF AIR IN AN URBAN AREA OF NATAL

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Due to its location on the continent, the city ofNatal (Rio Grande do Norte, Brazil) receives steady winds, making it knownworldwide as the city that has good air quality. However, a lack of studiesproving this title. This study aimed to assess ambient air quality in an urbanarea of Natal, (latitude 5º49’29 ‘’ south and longitude 35º13’34 ‘’ west),

inorder to determine the concentration of metals in Particulate Matter (PM10and MP2,5) of air in an area with heavy vehicular traffic in thecity. Sampling was carried out from January to December 2012. Samples werecollected on glass fiber filters by means of two high volume samplers (AGV PM2,5,and the AGV PM10) . Monthly averages ranged from 8.92 to 19.80 mg.m-3, wherethe annual average was 16,21 mg.m- 3 for PM10 and PM2,5monthly averages ranged from 2,84 to 7,89 mg.m-3, with an annual average of 5,61 mg.m-3. Theresults of PM concentrations were related to meteorological variables and forinformation on the effects of these variables on the concentration of PM with aPrincipal Component Analysis (PCA) was performed. The results of the PCA showedthat with increasing barometric pressure, the direction of the winds, therainfall and relative humidity decreases the concentration of PM and thevariable weekday little influence compared the meteorological variables. Atotal of 54 PM10 filters and 49 PM2,5 filters were subjected to acid digestion assisted bymicrowave and the samples analyzed by Inductively coupled plasma massspectrometry (ICP-MS). The highest concentrations of metals were for Pb and Cu,whose average PM10 values were, respectively, 5,34 and 2,34 ng.m-3and PM2,5 were 4,68 and 2,95 ng.m-3. Concentrations formetals V, Cr, Mn, Ni, and Cd were respectively, 0,13, 0,39, 0,48, 0,45 and 0,03 ng.m-3for PM10 fraction and for PM2,5, 0,05, 0,10, 0,10, 0,34and 0,01 ng.m-3. The concentration for As was null for the two fractions.

P4.72 - AIR QUALITY ASSESSMENT OF ATMOSPHERIC BY DIFFERENTIAL OPTICAL ABSORPTION SPECTROSCOPY (DOAS)

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The concern with theproblems related to the environment, such as air pollution, is increasinglygrowing nowadays. Degradation of air quality is a major problem that affectsurban and industrial areas as well as areas of influence of these regionsworldwide. Air quality is defined by controlling the concentration of majorpollutants (SO2, NO2 ,O3, CO and CO2)that directly influences the atmospheric air. The measurement of theconcentration of such pollutants in low concentration require apropiadastechniques. Among these techniques, the DIFFERENTIALOPTICAL ABSORPTION SPECTROSCOPY (DOAS) allowsto measure , simultaneously , traces of various chemical species in atmosphericair . The DOAS technique involves measuring the absorption of light by"fingerprints" left by the chemical species monitored as they passthrough a light beam of known intensity and spectral characteristics . This techniquewas used in (CTGAS -ER) Centre for Gas Technology and Renewable Energies toassess the air quality in the vicinity of CTGAS -ER region. This study was conductedin CTGAS -ER between 12th to December 20th, 2012 using the DOAS system (OpsisAB , Sweden) for the monitoring of chemical species SO2 , NO2, O3 , CO and CO2 simultaneously . The results of theconcentrations of these species were compared with the values for air qualityestablished by CONAMA No 03 of 1990 and showed thatfor these chemical species, monitored concentrations did not exceed the limitdetermined by the standard air quality . For CO2 the average hourlyconcentration was approximately 414 ppm , with peaks that begins in the morningand throughout the diurnal period.

P4.73 - IMPACT OF CHEMISTRY BOUNDARY CONDITION ON TROPOSPHERIC OZONE SIMULATIONS IN THE METROPOLITAN AREA OF SAO PAULO USING WRF-CHEM MODEL

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The WRF-Chem (Weather and Research Forecast with Chemistry Model) has been applied to simulate the formation and transport of ozone and particulate matter in the Metropolitan Area of São Paulo(MASP), Brazil. The simulations are being considered as a tool to understand the transport of the pollutants from the urban area to the surroundings and the contribution of remote sources to the air quality impairment of the city . The objective of the ongoing research is to asses the impacts of using time dependent chemical lateral boundary conditions (CBC) on the simulation of tropospheric ozone concentration and ozone vertical structure over the MASP. The CBC considered in the simulations come from MOZART -4 chemistry transport model and is assimilated to WRF-Chem using the mozbc tool. Two simulations were carried out with RADM2/SORGAM chemistry mechanism, the first one was set-up to run with an idealized profile (default case) and the second one enabling the new CBC. The period of study was from 15 to 18 May and from 30 October to 1November of 2006, when ozonesondes were launched and surface concentrations of pollutants were measured. The simulations were compared with observations from air quality stations located in the city operated by the Environmental Protection Agency of São Paulo State (CETESB) and with the information from the ozonesondes profiles. The partial results show that there is an improvement in the representation of ozone vertical profiles over 3 km and around the midday.Using MOZART boundary conditions results in smaller surface ozone concentration and less correlated with observations than the simulated values using the default CBC.

P4.74 - CHEMICAL AGING OF O3-CO-NOX IN UPPER TROPOSPHERE CONVECTIVE OUTFLOW AS PREDICTED BY WRF-CHEM FOR THE MAY 29-30, 2012 DC3 CASE STUDY

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Thunderstorms can affect ozone(O3) in the upper troposphere (UT) by mixing stratospheric O3into the UT, transporting boundary layer air (which is rich in carbon monoxide(CO) and volatile organic compounds), to the UT, and producing nitrogen oxides(NOx) from lightning. These O3 precursors then chemicallyage in the UT convective outflow regions producing O3. To quantifythe impact of midlatitude, continental thunderstorms on UT composition andchemistry, the Deep Convective Clouds and Chemistry (DC3) field campaign, whichtook place in the central U.S. in May and June 2012, included cases of samplingnear active thunderstorms followed by sampling the same convective outflow thefollowing day. The May 29-30, 2012 DC3 case study comprises a severethunderstorm that developed and matured in northern Oklahoma. The DC3 aircraftextensively sampled the inflow and outflow regions and the ground-basedoperations obtained dual-Doppler and polarimetric radar, weather balloonsoundings, and lightning mapping data. On May

30, the aircraft sampled the sameconvective outflow region over the southern Appalachian area.

In this study, we use theWeather Research and Forecasting model coupled with Chemistry (WRF-Chem) to analyzethe May 29-30 convective outflow plume that was a result of the northernOklahoma storm. The model results are evaluated with aircraft observations,radar and lightning data. The WRF-Chem simulations are conducted at 15 km grid-spacing, requiring a convective parameterization, yet allowing forregional-scale impacts to be studied. Both the observations and model resultsshowed CO and NOx mixing ratios of up to 120 ppbv and 1-2 ppbv,respectively, in both the fresh convective outflow and aged convective outflow.Ozone mixing ratios of ~80 ppbv were measured and predicted in the freshconvective outflow, and were 10-20 ppbv greater in the observed aged convectiveoutflow, but not in the WRF-Chem results. Analysis of the chemical processescontributing to the O3 chemistry will be done by both sensitivitysimulations and diagnostics within the model that track all the productionterms of ozone and other specified species. Comparisons of WRF-Chem resultswith Lagrangian model simulations will show how more explicit chemistry affectsthe chemical aging predictions.

P4.75 - SO2 EQUILIBRIUM IN RAINWATER AND ITS CHEMICAL COMPOSITION

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The chemical composition of rainwater is a final product of the gas and particulate matter incorporation and also of chemical reactions that occur during the clouds formation and of the falling rain drops. In the Metropolitan Area of SãoPaulo (MASP), the SO2 has been monitored by the Environmental Agency of São Paulo State (CETESB) since late 1970s. The periods characterized by significant rainwater data has enabled the analyses of the interactions between the gas (SO2) and the aqueous (SO42-) phases. From an equilibrium simple model (Henry's Law), the interaction of these species with potential neutralization species (NH3) of the atmospheric acidity was estimated. The SO2 data from CETESB and the rainwater chemical composition in MASP were evaluated from 2002 to 2010. Two rainwater sample sets were analyzed, one in the west region (59 samples) and other in the central region of Sao Paulo city (430 samples). The respective volume weight mean values (VWM) were7.1 μmol/L of sulfate and pH 5.3 for the former and 11.5 μmol/L of sulfate andpH 5.4 for the latter. In the period above, the annual average of SO2in MASP was 12 μg/m3 and hourly maximum reached 85 μg/m3. The calculated pH value from the SO2 dissolution in rainwater of MASP was based on the Henry's Law considering kef, which means the gas solubility from the equilibrium displacement by the formed acid in aqueous phase. The observed experimental acidity varied from 4.55 to 7.33, while that the calculated values in function of SO2 were between 2.20 and 5.23,being, therefore, two power orders more acid. This difference can be related with the NH3 presence in the atmosphere, neutralizing the acidic medium. The relationship between the measured concentrations of NH4+and SO42- in aqueous phase was linear (R2 = 0.706)with the slope of 2.34, indicating a proportion of 2:1 (considering, NH4+:-SO42-and NH4+:HSO4-), besides the availability of NH3 for neutralization of the formed nitric acid (NH4+:NO3-).

P4.76 - ATMOSPHERIC COMPOSITION MONITORING WITH IASI AND MOPITT: CO, A TRACER OF POLLUTION

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DaCarbon monoxide (CO) is an importanttrace gas for understanding air quality and atmospheric composition. It is agood tracer of pollution plumes and atmospheric dynamics. In this presentationwe analyse the global and regional CO distributions as seen by remote sensorsonboard of satellites, in particular the nadir-looking thermal infrared MOPITT/Terraand IASI/MetOp instruments. Since several years of data are now available, we showCO distributions over polluted and clean regions for the period 2008-2013. We willalso describe how MOPITT and IASI data are currently assimilated in the MACCproject in near-real time in order to generate CO pollution forecasts.

Finally we discuss a local pollutionepisode which occurred over China during January 2013. Airpollution levels have been dangerously high, reaching 40 times recommendedsafety levels. In this smog episode, IASI observations showed high concentrations ofseveral key trace gases, including CO. Our findings demonstrate the ability ofthermal infrared instruments such as IASI to monitor boundary layer pollutantsin specific conditions, to support air quality evaluation and management.

P4.77 - CHEMICAL CHARACTERIZATION OF PM2.5 IN BEIJING-CHINA

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Haze frequently occurs in China especially in theNorth China Plain during fall and winter in recent years. Significantvisibility reduction and high PM2.5 concentration are commonduring severe hazy days. There are occasions that haze can last for as long asone week. This study will present the results of chemical characterization ofPM2.5 from Beijing, the capital of China and comparecomposition and sources of PM2.5 between haze and non-hazedays. The chemical characterization of PM2.5 include its majorand trace composition using multiple techniques. Major composition includesulfate, nitrate, ammonium, organic carbon and elemental carbon measured by ionchromatography and the Sunset ECOC (TOT method), respectively while tracerspecies include metals using inductively coupled plasma-mass spectrometry(ICP-MS) and primary organic compounds and secondary organic tracers includingalkanes, polycyclic aromatic hydrocarbons (PAHs), fatty acids, methyltetrols, etc. measured by gas chromatography-massspectrometry (GC-MS). Considering only about 20% of organic aerosol can beidentified by GC-MS, we also analyzed organic aerosol using FTIR for differentfunctional groups, which can explain all measured organic mass. In addition,single particles are also sized and chemically measured using a single particleaerosol mass spectrometry (SPAMS) which can provide source information usingthe ART-2a method. Therefore, fine particles during haze and non-haze periodsare chemically characterized using multiple tools and the characteristicsduring the haze periods are discussed by comparing to those of non-hazeperiods. It is clearly seen that secondary components including organiccompounds and inorganic ions (those that are not from primary emissions) aremore important in PM2.5 during haze

periods and anthropogenic components are more enriched in PM2.5 in China compared to the U.S. More discussion about chemicalcharacteristics measured by multiple instrumentations will be presented.

P4.78 - AIR POLLUTION IN CENTRAL MEXICO CHARACTERIZED BY OPTICAL REMOTE SENSING

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The pollution in megacieties and from other important emission sources can nowadays be seen form space through remote sensing instruments. However, satellite observations like those with NADIR viewing geometries have decreased sensitivity near the Earth's surface and the analytical algorithms are generally optimized to detect pollution plumes in the free troposphere or above. Ground-based observations are thus necessary in order to reduce uncertainties in the satellite products. As we will show, Mexico City and its surroundings is well characterized by ground-based remote sensing measurements like from two stations with solar-absorption FTIR (Fourier Transform InfraRed) spectrometers and a newly formed network of MAX-DOAS (Multi-AXis Differential Optical Absorption spectrometers) and LIDAR (LIght Detection and Ranging) instruments. Examples will be provided of how the evolution of the mixing-layer height is characterized and the vertical column densities and profiles of gases in and outside the urban area are continuously monitored. The combination of ground-based and space-borne measurements is used to improve the current knowledge in the spatial and temporal distribution of key pollutants from this megacity.

P4.79 - ATMOSPHERIC CONCENTRATION AND ITS DEPOSITION OF RADIONUCLIDES RELEASED BY FUKUSHIMA DAIICHI NUCLEAR POWER PLANT ACCIDENT

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In March 2011, severe accident in the Fukushima Daiichi nuclear power plant (FDNPP) occurred after the 2011 Great East Japan Earthquake and resulting Tsunami. As a result, large amounts of radionuclides have been released in the environment, in which 131I of 150-170 PBq and 137Cs of 8.8-36.6 PBq were emitted in the atmosphere in March 2011.

The FDNPP-derived radionuclides dominantly spread out about 50 km of northwest from the FDNPP. Radiocesium (134Cs and 137Cs) deposited on land surface is tightly bound into soil mineral. Therefore, there is lesser migration of radiocesium on land and from land to ocean via river, and its transfer from soil to plant decreased with time. On the other hand, higher atmospheric deposition rates of radiocesium (around 1 Bq m-2 month-1), which are more than one magnitude greater than pre-Fukushima level, have been observed at monitoring stations within about 300 km from the FDNPP; especially, high monthly 137Cs deposition rates (around 1 kBq m-2 month-1) occurred at the Futaba station about 5 km from the FDNPP. The monitoring data suggest that atmospheric releases of radiocesium from the FDNPP have continued in the late 2013, although release amounts of radiocesium are relatively small.

Atmospheric dispersion of the radionuclides from the FDNPP was also suggested to the large area of the entire North Pacific region with in a few weeks by a GCM model. Transport of the radioactive material over the ocean is summarized based on the measurement of 131I and 137Cs concentration of the marine aerosol samples collected at the observation points onboard along the 30 km offing FDNPP and during the cruises corresponding to the disaster by research vessels. Based on the atmospheric radioactivity measurements, 87% of 131I and 78% of 137Cs of total emission amount has deposited on the ocean.

P4.80 - THE BACHOK ATMOSPHERIC RESEARCH LABORATORY. A NEW SOUTH EAST ASIAN MONITORING STATION FOR REGIONAL AND LOCAL OBSERVATIONS. 2014 PRELIMINARY RESULTS.

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The Universiti Malaya IOES (Institute of Ocean and Earth Sciences) Atmospheric Research Laboratory is based on the East coast of Peninsular Malaysiaon the South China Sea. This is a recently developed tower station designed to investigate coastal meteorology, land-sea exchange processes and long range pollutant transport. The station has recently been extensively equipped with a suite of instruments focused on trace pollutant, greenhouse gas, aerosol and meteorological observational studies.

This site has the potential to provide information to help better constrain emissions and transport of key air quality and climate species intropical Asia as well as outflow and inflow over the wider region. The area is under-analysed and is key to the understanding of global chemistry-climate interactions and transport.

In early 2014 the new observational program was initiated with a demonstration activity at the station where partners from Malaysia, UK Universities, UK NCAS, CSIRO and NIWA deployed instrumentation. This activity was comprised of an intensive one month observational period making measurements of species including O3, NOx, SO2, CO, H2,CO2, CH4, VOCs, OVOCs, HCHO, selected halocarbons and d13CH4.The broad aim of this activity was to demonstrate the potential of the site for both targeted campaigns as well as long term observational programs in the heterogeneous and source rich dynamically variable tropical Asian environment.

The intensive monitoring period was timed to coincide with the dry period at the end of the South East Asian Winter monsoon with the aim of capturing local variability, regional scale transport as well as long range transport associated with the “Tropical Cold Surge” phenomenon. This transport effect is associated with outflow from Siberian and Northern Chinese high pressure systems into Southern Asia and can result in rapid air mass transport of anthropogenically polluted, processed air from China and the Indochinese peninsula into areas of dominantly biogenic emissions or into clean background regions.

This manuscript introduces the capability of the site, ongoing atmospheric research being conducted at Bachok as well as describing initial results from the Jan 2014 demonstration activity.

P4.81 - VERTICAL TRANSPORT MECHANISMS OF BLACK CARBON OVER EAST ASIA IN SPRING DURING THE A-FORCE AIRCRAFT CAMPAIGN

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Mechanismsof vertical transport of black carbon (BC) aerosols and their three-dimensionaltransport pathways over East Asia in spring were examined through numericalsimulations for the Aerosol Radiative Forcing in East Asia (A-FORCE) aircraftcampaign in March-April 2009 using a modified version of the CommunityMultiscale Air Quality (CMAQ) modeling system. The simulations reproduced the spatial distributions of massconcentration of BC and its transport efficiency observed by the A-FORCEcampaign reasonably well, including its vertical and latitudinal gradients anddependency on precipitation amount that air parcels experienced during thetransport. During the A-FORCE period,two types of pronounced upward BC mass fluxes from the planetary boundary layer(PBL) to the free troposphere (FT) were found over northeastern andinland-southern China. Over northeasternChina, cyclones with modest precipitation were the primary uplifting mechanismof BC. Over inland-southern China, bothcumulus convection and orographic uplifting along the slopes of the TibetanPlateau played important roles in the upward transport of BC, despite itsefficient wet deposition due to a large amount of precipitation supported by anabundant moisture supply by the low-level southerlies. In addition to the midlatitude (35–45°N) eastwardoutflow within the PBL (21% BC removal by precipitation during transport), theuplifting of BC over northeastern and inland-southern China and the subsequentBC transport by the midlatitude lower tropospheric (50% BC removal) andsubtropical (25–35°N) midtropospheric westerlies (67% BC removal),respectively, provided the major transport pathways for BC export fromcontinental East Asia to the Pacific.

P4.82 - MODELING GASEOUS AND AEROSOL POLLUTANTS OVER BOGOTÁ USING WRF-CHEM

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The Weather Research and Forecasting modelcoupled with chemistry (WRF-Chem v. 3.5) has beenimplemented over Bogotá and validated against ground-based observations. Bogotáis a tropical South-American megacity located over a plateau in the middle ofvery complex terrain. An extensive sensitivity analysis to model gasphase chemistry schemes was performed. The WRF-Chemmodel was adopted for simulating the hourly gas and aerosol concentrations forthree episodes, representative of dry, intermediate/transition and wet periodsin 2010. The computational domains were chosen of 187x157x32,223x238x32, 79x85x32 and 55x55x32 grid points with horizontal resolutions of27, 9, 3 and 1 km, respectively. The model was initialized with real boundaryconditions using NCAR-NCEP's Final Analysis (FNL) and a 1ox1o(~111 km x 111 km) resolution. Boundary conditions were updated every 6 hours usingreanalysis data. The emission rates were obtained from global inventories,namely the REanalysis of the TROpospheric (RETRO)

chemical composition and the EmissionDatabase for Global Atmospheric Research (EDGAR). The model was run withalternative model configurations, including gas phase schemes and the aerosolmodule. Comparisons between estimated and observed gasand aerosol pollutant concentrations were carried out through a seriesof common statistics. Overall, the present case studyshows that the model has an acceptable performance over Bogotá. Thisstudy provides a general overview of WRF-Chem and can constitute a referencefor future mesoscale air quality modeling exercises over Bogotá and other Colombian cities.

P4.83 - HEALTH IMPACTS FROM BIOMASS BURNING IN THE AMAZON REGION

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The Brazilian Amazon contains about 40% of the world's remaining tropical rainforest, corresponding to 61% of the area of Brazil. However, human activities have become important agents of disturbance in the Amazon basin. The effects of biomass burning on human health are significant in the deforestation arc. However, there are few studies to understand the mechanism of action of aerosols in human health. Thus, we collected filters with particulate matter smaller than 10 μm (PM10) in the southwest region of the Brazilian Amazon, to investigate the effects of biomass burning at a molecular and cellular level. The chromatography-mass spectrometry analysis showed the presence of carcinogenic and mutagenic compounds, including total and oxygenated-Hydrocarbons Polycyclic Aromatic Hydrocarbons. After chemical analysis, we define a dose below the limit established by the World Health Organization (30 μg/m3 of PM10) to investigate the induction of both DNA damage and cell death in human lung cells (A549). We observed that 24 hours after exposure to PM10, there was an induction of cell cycle arrest at G1 phase, as well as an increase in the expression of p53 protein and formation of DNA strand breaks (as detected by the alkaline comet assay). After 72 hours of exposure to PM10, we detected a significant increase of cells in the sub??-G1 fraction, indicating that inhalable particles cause apoptosis in lung cells. Additionally, at his time point, we observed the formation of the phosphorylated form of the histone H2AX (gamma-H2AX), which correlated with the activation of Caspase 3, suggesting that the induction of gamma-H2AX may be associated with the DNA fragmentation during apoptosis. To further study the cell death pathway, we performed an analysis under a fluorescence microscopy that allows distinguishing between apoptosis and necrosis. Interestingly, not only apoptosis, but also necrosis, is a cell demise pathway induced by PM10. Furthermore, preliminary results show that the exposure to PM10 induces autophagy in studied cells. This work shows an important advance in understanding the molecular effects induced by the exposure of lung cells to PM10 that can be potentially related to the increase of human health problems in the Amazon region.

P4.84 - ONE YEAR IN-SITU AEROSOL MEASUREMENTS IN ALGERIA

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The Mediterranean region is characterized by a complex mixture of (mainly transported) aerosols having different origins (anthropogenic,biogenic, biomass burning, dust, sea spray), with strong east-west andnorth-south trends observed, both by means of concentrations and chemicalcomposition.

In 2011, an observatory of atmospheric chemical composition has been set up in Algeria as a contribution to MISTRALS (Mediterranean Integrated Studies at Regional and Local Scales)-CHARMEX (Chemistry-Aerosols Mediterranean Experiment) Mediterranean Network. The observatory station, namely Bou-Ismail station (Tipaza), lied in the Algerian Mediterranean cost, 40 km west of Algiers, is an ideal location to assess the background pollution in Mediterranean region where the trans-boundary pollution coming from Southern European countries and short or long range pollution travelled from Algiers or other cities are mixed up. Since Algeria, a central North African country represents an entrance road of air pollution coming from Europe to Africa and vice versa, the in-situ aerosol measurements conducted since July2011 enabled chemical characterisation of particulate air pollution and better understanding of their chemical transformation. On the other hand, the in situ chemical characterization of local pollution derived from biogenic emission, biomass burning and anthropogenic activities was particularly useful because, despite desert dust, the impact of other air pollution that are transported from North Africa to Europe is still scarcely studied.

This study reports for the first time detailed one year period (July 2011-June 2012) aerosol mass closure in southwest of Mediterranean (Algeria). The concentrations of water soluble ions in PM10 ranged from 3.6 µg m-3 to 106.7 µg m-3 and showed high seasonal modulation.

P4.85 - SEASONAL AND DIURNAL TRENDS OF C2-C12 HYDROCARBONS MEASURED IN THE METROPOLITAN AREA OF SÃO PAULO

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With the purpose to improve the knowledge of ozone precursors, a high resolution monitoring was performed for more than 2800 sampling hours, during 2012-2013, using online measurements of volatile hydrocarbons (HCs). This study aimed to identify and quantify more than 50 volatile hydrocarbons, analyzing their seasonal trends and diurnal variations in the Metropolitan Area of São Paulo (MASP).

The monitoring campaigns were carried out employing a Perkin Elmer system, which is based on:1) Thermal Desorber (TD) fitted with an air sampler accessory, in which the sample is concentrated in a sorbent trap and then is desorbed by rapid heating and transferred by ultra-pure helium (6.0) into the chromatographic system; 2) Clarus 500 gas chromatography with two columns and two flame ionization detectors (FID). For quantification of HCs, there were performed curves withOzone Precursor Mix standard (100 ppbv, Restek) which was diluted on differentconcentrations. Pollutants concentrations (NO2, NO, O3 and CO) were obtainedfrom the air quality network of Environmental Agency of São Paulo state(CETESB).

During one year of monitoring, several of the aromatics HCs showed higher concentrations in the winter season, mainly toluene, (m-, p-, o-) xylenes, 1,2,3-trimethylbenzene, ethylbenzene and m-ethyltoluene.At the same time, alkenes presented higher concentrations during spring and summersuch as ethylene, acetylene, trans-2-butene and 1-butene. The fractional contribution of different classes of HCs was calculated and it couldbe seen that these proportions showed some seasonal deviations. Aromatics showed an increaseduring winter (47%) and remained constant during summer, spring and autumn(37%). Nevertheless, heavy alkanes (C7-C12) exhibited a decrease during winter(19%) in relation to other seasons (around 26%). The seasonal contribution of HCs was calculated for the ozone formation by using the maximum incremental reactivity (MIR) scale, being observed a major influence of 1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, cis-trans-2-butene, isoprene and m-ethyltoluene in the mass of potential ozone formed. High correlations between HCs from vehicular emissions and NO were found, mainly during the winter and the spring, concerning acetylene, ethylene, benzene and toluene.

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Keywords:NMHCs, sampling, urban air pollution, ozone precursors

P4.86 - CHARACTERIZING SOUTH AMERICAN BIOMASS BURNING EMISSIONS WITH SATELLITE OBSERVATIONS

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The height and concentration of aerosols are sources of uncertainty in the retrieval of NO2 tropospheric columns from the OzoneMonitoring Instrument (OMI), as they can have significant influence on top of the atmosphere radiances measured by the satellite. It has been shown that in the case of highly scattering aerosols, such as anthropogenic pollution dominated by sulfate, an implicit empirical correction occurs via modified cloud fractions and cloud pressures. For strongly absorbing aerosol cases, such as black carbon from biomass burning, the presence and efficacy of such an implicit correction is not clear. In this work, we utilized aerosol properties derived from coincident retrievals by the OMI near-UV aerosol algorithm to explicitly account for aerosol optical effects in the air mass factor (AMF) calculation for tropospheric NO2. With the improved NO2 tropospheric column observations, we constrained surface NOx emissions from biomass burning over South America. Combining these NOx emissions estimates with a bottom-up fuel consumption database (GFED v3), we derived NOx emission factors for deforestation burning, as well as burning in woodland and savanna biomes. We have found that during years of severe drought – 2005 and 2010 – NOxemission factors for deforestation burning derived from the DOMINO NO2 retrieval are significantly lower than for typical burning conditions. We investigated possible factors that could lead to this variability – 1) underestimation of NO2 columns as a result of aerosol shielding, 2) bias in fuel consumption estimates, and 3)variability in fuel composition.

P4.87 - CHARACTERIZATION OF SUBMICRON PARTICLE NUMBER SIZE DISTRIBUTIONS IN A BUSY STREET CANYON

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Street canyons have been focus of intensive research because of their contribution to the urban heat island development, and the high concentrations of atmospheric pollutants emitted by motor vehicles under reduced ventilation conditions. Even though many studies associate the exposure to submicron particles with adverse health effects, particle number concentrations are still not regulated. A reliable characterization of air-borne submicron particles is essential for developing a regulatory framework.

We report results of measurements conducted in a busy street canyon in Stockholm (~28,000 vehicles/day), Sweden. Particle number size distributions (PNSD) were measured with a differential mobility particle sizer in the diameter range 25-606 nm, and to help characterize emission sources, other variables were simultaneously observed: total number of particles, light-absorbing carbon mass concentrations (MLAC), NOx, CO, PM10, and traffic rates.

On weekdays, the daily pattern of aerosol and gases showed maximum concentrations at 08:00-09:00 local time, matching the morning traffic rush hour (~2000 vehicles/hour). During the morning rush hour, the total number of particles mounted to 76,000 particles cm-3, the PNSD presented a strong mode at 25 nm particle diameter, NOx concentrations increased to 220 µg m-3, and MLAC reached 10.2 µg m-3. At weekends, the traffic rate peak was lower (~1600 vehicles/hour) and spanned over a wider period (12:00-17:00) in relation to weekdays. Traffic rates were always higher on weekdays compared to weekends, but for early morning hours (00:00-05:00). This increase in the traffic counts on weekends was accompanied by the highest MLACof the day (6.3 µg m-3), a higher NOx/CO ratio compared to weekdays, and PNSD peaking at ~50 nm. However, PM10 concentrations always remained lower than weekday concentrations (daily mean of 46.3 µg m-3 on weekends versus 59.0 µg m-3 on weekdays). This rise in MLAC and NOx concentrations and PNSD mode shift in the early hours of weekends might be associated with a change in the vehicle fleet share, which was mainly composed of diesel-run taxis.

Results from this work will provide valuable input for dispersion models applied to street canyon environments, in air quality and traffic management, pollution forecasting, and population exposure studies.

P4.88 - MOBILE MEASUREMENTS OF LIGHT-ABSORBING CARBON USING A TAXI FLEET

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Carbon-containing particles are associated withadverse health effects, and its light-absorbing fraction was recently estimatedto be the second largest contributor to global warming after carbon dioxide. Knowledgeon the spatiotemporal variability of light absorbing carbon (LAC) particles inurban areas is relevant for air quality management and to better diagnose thepopulation exposure to these particles. This work reports on the first mobileLAC mass concentrations (MLAC) measured on-board four taxis in theStockholm metropolitan area in November 2011. On average, concentrations were higher and morevariable during daytime (median of 1.9 µg m-3, and median absolutedeviation of 2.3 µg m-3). Nighttime (21:00-05:00) measurements werevery similar for all road types and also compared to levels monitored at anurban background fixed site (median of 0.9 µg m-3). We observed alarge intra-urban variability in concentrations, with maxima levels inside roadtunnels (median and 95th percentile of 7.5 and 40.1 µg m-3,respectively). Highways presented the second ranked concentrations (median and95th percentile of 3.2 and 9.7 µg m-3, respectively)associated with highest vehicle speed (median of 65 km h-1), trafficrates (median of 62,000 vehicles day-1 and 1500 vehicles h-1),and diesel vehicles share (7-10%) when compared to main roads, canyon streets,and local roads. Multiple regression modeling identified hourly traffic rateand MLAC concentration measured at an urban background site as thebest predictors of on-road concentrations, but explained only 25% of theobserved variability. This feasibility study proved to be a time- and cost-effectiveapproach to map out ambient MLAC concentrations in Stockholm andmore research is required to represent the distribution in other periods of theyear. Simultaneous monitoring of other pollutants, closely correlated to MLAClevels in traffic-polluted environments, and including video recording of roadand traffic changes would be an asset.

P4.89 - SOCIAL AND ENVIRONMENTAL VULNERABILITY IN THE BRAZILIAN AMAZON RIPARIAN COMMUNITIES EXPOSED TO BIOMASS BURNING.

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Introduction: The multiple causes related to exacerbation of diseasemakes the knowledge of the socio-economic conditions of population veryimportant to understand the vulnerability that some social groups are exposed. Objective: To identify the mainsocioeconomic, demographic and health characteristics of children living in tworiparian communities (Cuniã and Belmont) of Rondônia State, in the southernBrazilian Amazon. Method: Weconducted a cross-sectional study through a survey to capture informationregarding the characterization of the household, health conditions and familyhistory of exposure of the child and teenagers's morbidity and assessment ofasthma. We evaluated the growth and development of the study population by Zscore, the prevalence of intestinal parasites, anemia and iron deficiency. Weused the chi- square test and Student's t to evaluate the associations betweengroups. Results: The water uptake to48.8 % of households Belmont comes straight from the river, while in 57.5 % ofhouseholds of Cuniã water comes from shallow. The majority of people surveyeddo not use any type of home treatment for water. The main destination ofgarbage from both communities is burning. Cuniã has higher consumption of fishand fruits while Belmont has higher consumption of red meat. Between thechildren and teenagers of the study, about 2% are low weight and thinnessaccentuated, while 11% were overweight and 3% were obese. The diagnosis ofintestinal parasites was positive in 38% of the population. The prevalence ofanemia was higher in the Cuniã community while iron deficiency was higher inBelmont. Conclusion: The communitieshave poor access to education and health, low income and limited sanitation.Children and adolescents have a high prevalence of intestinal parasiticinfections and nutritional deficiencies coexist with overweight. It is relevantto invest in better living conditions of children as a strategy to improvehealth and reduce health disparities across the life course.

P4.90 - SPATIAL ANALYSIS OF THE RELATIONSHIP BETWEEN THE CARDIOVASCULAR MORTALITY AND SOCIOECONOMIC VULNERABILITY IN THE METROPOLITAN AREA OF CUIABÁ RIVER VALE, MATO GROSSO, BRASIL, 2009-2011.

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Introduction: We can use mapping health problemsas diagnostic and planning tools in public health. Objective: To analyze the spatial distribution of mortality fromcardiovascular disease in subjects over 45 years old, living in the cities ofCuiabá and Várzea Grande from 2009 to 2011, and its relationship withsocioeconomic variables. Methods: Weconducted an ecological study with data from the Mato Grosso State HealthDepartment and the Brazilian Institute of Geography and Statistics. Wecalculated crude and standardized mortality rates from cardiovascular disease(CHD), acute myocardial infarction (AMI) and stroke for census area, sex andage group. It was analyzed using the global and local Moran autocorrelationcoefficient to identify critical areas for mortality rates. We evaluated thesocial vulnerability using the Local Socioeconomic Vulnerability Index (IVSL),developed with five agreed socioeconomic indicators. We did use the Spearmancorrelation test to measure the association between mortality and the IVSL. Results: We observed clusters of highmortality rates (577.56 to 1277.77 deaths/100 thousand inhabitants) in theEastern region from Várzea Grande and Southern region from Cuiabá. The socioeconomic vulnerability of both towns canbe classified as median, however all administrative regions showed areas of high IVSL. The correlations between IVSL and standardized mortalityrates were low (rho<0.3), however the correlations were statisticallysignificant at level of 1%. The IVSL showed direct correlation with thestandardized mortality rates. The highest correlations were observed for DC(rho=0.243) and elderly age > 65 years (rho=0.208). Conclusion: Areas with high CHDmortality rates seem to be concentrated in areas of high socioeconomic vulnerabilityin both towns. We point out the Eastern Region from Várzea Grande andthe Southern region from Cuiabá as the most vulnerable areas and male andelderly are more susceptible for CHD mortality.

P4.91 - INFLUENCE OF CLIMATE VARIABILITY IN THE BLOOD PARAMETERS OF CHILDREN AND TEENEAGERS FROM BRAZILIAN AMAZON

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Introduction: In the Brazilian Amazon region, the smoke generated by biomassburning during the dry season has great impact on the health of exposedpopulations due to high concentrations of pollutants. Objective:To analyze the influence of climate variability in the blood parameters relatedto iron hemostasis, inflammation, and allergy in the Brazilian Amazon. Method:We conducted a cross-sectional study in schoolchildren from two ripariancommunities of Rondônia (Cuniã and Belmont), describing the behavior ofhematocrit, hemoglobin, ferritin, serum iron, leukocytes, lymphocytes,eosinophil, C-reactive protein and Immunoglobulin E between dry and rainy seasons. Weused the chi-square and the prevalence ratio for the comparison of proportionsin both periods. We, also, used Student t test to compare means. Results:We observed statistically significant decreases in hemoglobin and hematocrit duringthe rainy season compared to the dry season. Theprevalence of anemia was around 4%, in the dry season, and 12%, in the rainyseason for the whole communities. Therewas 35% lower (- 0.9 CI 0.1%) probability of anemia in the dry season. Cuniã has higher prevalenceof anemia when compared to Belmont. Serumferritin concentration showed higher in the dry season, with an averageconcentration of 48.5 ng/mL. Serum iron averages was 68.7 mcg/dL, in the dryseason, and 77.5 mcg/dL, in the rainy season. Theprevalence of iron deficiency was higher on dry season, with an average of 25.8%of abnormal values. The parameters of eosinophil, lymphocytes, leukocytes,C-reactive protein and Immunoglobulin E showed no seasonal differences. Conclusion:The hematological parameters of the red series and hemostasis of blood ironexhibited significant seasonal variation, which coincides with the region's dryseason when, also, there is an increase of atmospheric pollutants derived from biomassburning. Theinflammation and allergy parameters used in this study were not sufficientlysensitive for screening for subclinical effects related to seasonal biomass burning.

P4.92 - STUDY OF NOX AND SO2 POLLUTION FROM SHIPS ANCHORED IN THE PORT OF RIO DE JANEIRO AND THE IMPACT ON AIR QUALITY

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The world seaborne trade hasincreased with risingrates in recent years, where the high rate of growth ofthe emerging economy isprimarily responsible for this growth. As a result ofincreased global trade,there is a corresponding increase in shipping and fueldemand, hence an increaseof emissions of air pollutants generated. The rising petroleum and gas industryin Brazil havelaunched the regionalmarine logistic tosupport the settling of newlyoperated platforms overthe Continental Shelf and at offshoresites. TheNational Agency for Waterway Transportation portrayed thatbetween 2006 and2011 the Brazilian fleet of marine support expandedby around 87%. Supply vessels largely used haveahigh demand of oil to make continued use of the propulsionengines,auxiliary engines and boilers, which resultsin continuous emissionof pollutants, today consideredas oneof the major polluter among other marinetransportation ways. Recent studies estimate thatapproximately 70%of ship emissions occur at 400 km from the coast, inaverage, indicatingthe significant impact of theseemissions to coastal populationsand ecosystems. The main goal ofthis workis to provide an primarily estimate of theemissions of NOx and SO2from ships anchored inGuanabara Bay, andunderstand their relative contribution in the context of theCity of Rio deJaneiro. From the calculation of NOx and SO2 emissionof supply vessels, we simulated 24-hour scenario ofatmospheric concentrationpatterns in pollutant plumes around Guanabara Bay by the use ofAERMOD software (Lakes Environment) For each scenario we usedthe local meteorological batabase,the regional geomorphology, vesselpositioning and quantity based on the realtime marine traffic (available at: http://www.marinetraffic.com/pt/ais/home). Asexpected results, we intend s to comparetheoretical outputs with data from fixedmonitoring stations operated around theGuanabara Bay by INEA.

P4.93 - PARTICULATE MATTER IN SÃO PAULO: TRANSPORT OVER THE CITY IN THE WINTER MONTHS

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Particles are a commonpollutant and can lead to health problems which justify the exhaustive studiesconcerning mass concentration and composition of aerosols. São Paulo, capital of São Paulo State, with more than 19 millioninhabitants, 7 million vehicles, as well as the major industrial andtechnological park of the country, has high concentrations of air pollutants,especially in the winter. Air pollution, high building density, and a lack ofgreen areas, combined with the proliferation of asphalt and concrete surfaces,have resulted in urban heat island effects, and rainfall events of greaterintensity. São Paulo has an extensive air quality monitoring network, which hasshown that ozone levels often exceed the NAAQS (National Ambient Air Quality Standards) limits during spring and summer,and that concentrations of inhalable particles exceed the NAAQS limits mainly during the winter months, from June toAugust. For most urban areas in Brazil, vehicles are considered the principalsource of particles emitted to the atmosphere, 95% for São Paulo.The Environmental Company of São Paulo (CETESB) has amonitoring network with 39 stations aroundthe state, 20 in São Paulo city. In this study, particulate matter data (PM10and PM2.5) for eight stations distributed over the four regions ofthe city (North, South, East and West) were analyzed during the winter months of2013 in order to verify the transportbetween the regions. Meteorological and air quality data were correlated. Relativehumidity was not very low during the period. In June precipitation was abovethe average of the last years and in August below the average, with tendency tothermal inversions. West and East regions presented the highest concentrations,related to transport from other regions, vehicular emission and worstdispersion conditions (East region). NAAQS limits for PM2.5 were exceeded. Winter time isalways dangerous concerning air pollution. Government control policies arenecessary to reduce this problem.

P4.94 - OPERATIONAL AIR QUALITY FORECAST BASED ON VEHICULAR EMISSIONS INVENTORY FOR SOME METROPOLITAN AREAS OF SOUTHEASTERN BRAZIL

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Vehicularemissions are the main source of air pollutants in the Metropolitan Areas of SoutheasternBrazil. They are also a key ingredient in numerical modeling of air quality. WRF-CHEM model is being run operationally providing air quality forecasts forthe Brazilian States of Paraná, São Paulo, Rio de Janeiro and Minas Gerais since October2011. Meteorological initial and boundary conditions are given by the 12 UTCGlobal Forecast System (GFS) 0.5o x 0.5o horizontalresolution model. Vehicular, biogenic, soil dust, and sea-salt emissions areconsidered. For the vehicular emissions, we used information provided by theLocal Environmental Protection Agency (Companhia de Tecnologiade Saneamento Ambiental – CETESB), Traffic Engineering Company (CET),Laboratório de Processos Atmosféricos (LAPAt-IAG-USP), and National Departmentof Transit (DENATRAN). Horizontal emissions were spatially distributedusing total road length (from OpenStreetMap) as a proxy. Measurements inside roadtraffic tunnels of gaseous and particulate compounds were used to computeemission factors and of vehicular counts were used for the temporal emissionsdiurnal variation. WRF-CHEM model version 3.2.1 is run with a horizontal gridof 9 km x 9 km, from 19 to 28oS and 39 to 51oW. Thechemical mechanism and aerosol modules chosen were CBMZ and MOSAIC (using 4sectional aerosol bins). Forecasts are made for a period of 84 hours and areavailable to the public at the internet site: http://www.lapat.iag.usp.br/aerossol/wrf9/index.php.

P4.95 - CHARACTERIZATION OF NOCTURNAL AEROSOL FORMATION IN HOUSTON DURING DISCOVER-AQ

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An Aerodyne High-Resolution Time-of-Flight Aerosol Mass Spectrometer was deployed aboard a mobile laboratory during the NASA DISCOVER-AQ mission in Houston, Texas during September 2013 and during several shorter periods through late 2013 and early 2014. Additional measurements included black carbon using an aethalometer, relevant trace gases including ozone (O3), nitrogen oxides (NOx), sulfur dioxide, volatile organic compounds (VOCs), and carbon monoxide (CO), and meteorological parameters. Based on previous (2006) observations in Houston of a local nocturnal peak in the CO-scaled diurnal profile of thes ampled sub-micron oxidized organic particulate matter, analysis focused on characterization of nighttime aerosol in this study. This focus also was motivated by enhanced organic aerosol loadings at night during more polluted periods within the DISCOVER-AQ timeframe. The nocturnal organic aerosol during such periods was characterized spectrally by a small relative degree of oxidation of the organic material (based on the relative contributions of the signals of mass-to-charge ratio (m/z) 44 and m/z 43). The material also displayed an enhanced ratio of the signal of m/z 30 to that of m/z 46, from which it can be inferred that the aerosol is influenced strongly by organic nitrates. Estimates indicate that organic nitrates comprised approximately 25% of the organic aerosol during periods of enhanced organic aerosol at night. Estimates of the rate of formation of nitrate radical, which is expected to be large due to the high levels of NOx and O3 in the Houston atmosphere, correlate with increases in organic aerosol loading, implying that nitrate radical oxidation of VOCs followed by phase partitioning of the resulting products is responsible for the local increases in particulate mass concentration. Analyses from measurements made near primary aerosol sources also will be highlighted.

P4.96 - BACKGROUND OZONE IN THE LOWER FREE TROPOSPHERE OVER CENTRAL CHILE.

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Photochemical campaignsconducted in Central Valleys of Chile show several common features occurring inothers regions of the world associated with the interactions of complexterrains and meteorological conditions, such as, convergence zones for ozone, layersof aged pollutant aloft, ozone recirculation, etc. Nevertheless, the data doesnot suggest that the stratospheric influx can increase the surface ozone leveland cause exceedances of the 8-h ozone standard as has been found in thenorthern hemisphere.

In this regards, Marchigue, arural town with minimal influence from local anthropogenic emissions, locatedapproximately 38 km east of the Pacific Ocean (34º 23' S, 71º 36', 140 m asl),has been selected to examine firstly the ozone free tropospheric background-concentration, and secondly the possible variations during the evolution ofsubtropical tropopause breaks. In this site, surface levels of ozone rarelysurpassed 30 ppbv, due to the lack of emission sources and to the consistentonshore sea breezes.

Vertical profiles of ozonewere measured using the electrochemical concentration cell type (Model 6A ECC).Three preliminary ozonesondes were launched with burst altitudes in the rangeof 30-35 km. Over the convective boundary layer, between 2.5-5.0 km, ozoneranged from 25-45 ppbv and averaged 34±5 ppbv. Now, inthe early winter, ten ozonesondes will be launched from the MarchigueMonitoring Station to describe the vertical profile of ozone during the passageof a deep trough as part of a 4-year effort for characterizing theStratospheric-tropospheric transport.

P4.97 - THE RATIO BETWEEN VOC AND NOX IN THE METROPOLITAN AREA OF SÃO PAULO AND THE OZONE FORMATION.

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The Metropolitan Area of São Paulo, composed of39 municipalities, with a population of 20 820 093 inhabitants according to IBGE (InstitutoBrasileiro de Geografia e Estatística) suffers with air pollution problems dueto the high concentration of ozone and particles in its atmosphere. Theprecursors of the ozone, NOx and Volatile Organic Compounds are emitted by thelight and heavy-duty fleet. There are a mixture of unconventional fuels likegasohol (gasoline with 22-25% ethanol), hydrated ethanol and diesel for thebusses and trucks. According to the Environmental Agency of São Paulo (CETESB),the vehicles are responsible for the emission of 97% of CO, 77% of HC, 80% ofNOx, 37% of SOx and 40% of Particulate Matter. The fleet is composed of morethan 7 million vehicles, comprising 49% of all the São Paulo State.

In order tostudy the ozone formation related to the emission of its precursors, the LAP-At(Laboratorio de Analise dos Processos Atmosfericos) is measuring continuously with-THERMO monitors, total HC and HCNM, NOx (NO and NO2) and Ozone, in a site inthe main campus of the University of São Paulo. Monitoring data from October15th to November 21 is presented as a previous analysis of the behavior of thecompounds.

The averageconcentration of hourly data for Ozone was (24,361 ± 16,521 ppb), HC e HCNM (0,2196± 0,2431 ppmC) and NOx (21,478 ± 16,569ppm). The meteorology was characterizedby a period with temperatures varying from 17,0°C to 33,5°C, with 16 days withoccurrence of precipitation. The ratios of VOC and NOx for the period from 7 to9 am were used to relate the emission inventories to ambient data. This ratiowas also considered in the classification of the area as a VOC or NOx-limitedatmosphere. The values ranged from 0,02 to 49,8 and the average ratio was 4,59.This values are different from previous analysis performed before 2005, whenmeasurements of HC were available.

P4.98 - GRIPS – GEOSTATIONARY REMOTE INFRARED POLLUTION SOUNDER

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Air quality and climate change are the most pressing global environmental issues of the twenty-first century. Despite decades of research, the sources and sinks of key greenhouse gases and other pollutants remain uncertain making atmospheric composition predictions difficult. The Geostationary Remote Infrared Pollution Sounder (GRIPS) will make high-precision, high-sensitivity measurements of carbon dioxide (CO2), carbon monoxide (CO), and methane (CH4) from geostationary orbit. From this observation vantage point, GRIPS can quantify the sources, net fluxes, and diurnal cycles of these gases on local and regional scales, for example over East Asia, the Americas, or Europe. GRIPS employs gas-filter correlation radiometry (GFCR) and uses the target gases themselves in place of dispersive elements to achieve outstanding throughput, sensitivity,and specificity. Since it detects a combination of solar reflected and thermal infrared, GRIPS will be able to provide boundary layer, mid tropospheric, and total column concentrations of CO, CO2, and CH4. When flown simultaneously with a UV/VIS spectrometer that measures trace reactive gases such as ozone (O3), nitrogen dioxide (NO2), and sulfur dioxide (SO2), the combination offers powerful fingerprinting capability to distinguish and quantify diverse pollution sources such as from biomass burning, electricity generation, and mobile sources. An airborne prototype of the GRIPS instrument, called AirGRIPS, was flown recently for a technology demonstration study. Additional aircraft campaigns are planned for AirGRIPS over the next year.

P4.99 - AIR POLLUTION EFFECTS ON MORTALITY - SINERGYC AND ISOLATED EFFECTS USING TIME-SERIES AND CASE-CROSSOVER ANALYSIS

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Exposure to air pollution and weather conditions occurs simultaneously, therefore, in addition to the isolated effect, factors interactions and modification effects are key issue. The present study characterized the effect of air pollution,isolated and synergistic effects, on mortality, from secondary data. Three methods were applied to evaluate the association of average daily concentration of pollutants (PM10, NO2,O3) on mortality caused by cardiovascular and respiratory diseases in the city of Sao Paulo - Brazil, from 1998 to 2008 . We compared the estimates of relative risk produced in several case-crossover approaches,time-stratified bidirectional and matched by the confounding factor, i.e.average temperature, to the results of a traditional time-series analysis. The risk factors synergistic effect was evaluated by the graphical interpretation of response surfaces generated by bivariate models. No statistical differences were observed between the results from the case-crossover and time-series analyses .The relative risk percent changes for cardiovascular mortality associated with an increase of 10μg/m3 in the 24-h average concentrations of PM10 and NO2 are,respectively, 0.85% (0.45-1.25) and 0.26% (0.04-0.48). The percentage increase in the risk of respiratory mortality was 1.60 (0.74-2.46) and 1.29%(0.46-2.12), respectively, for PM10 and O3. The case-crossover analyses confirmed that the positive association parameterized for pollutants is unlikely to be caused by confounding by temperature in time-series analysis. The simultaneous exposure to several levels of environmental factors, such as temperature and air pollution, may represent conditions as harmful as the predicted to extreme concentrations, due to the combined effect.

P4.100 - UNCERTAINTY OF AN ARTIFICIAL NEURAL NETWORK MODEL FOR THE PREDICTION OF PM10 CONCENTRATION

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Quality of life in urbanareas, especially in densely populated and industrialized areas is stronglyinfluenced by air quality. In these areas, predictive tools are needed to takepreventive measures against potentially high pollution episodes. Air qualitymodels are one of the most used tools for this purpose, since they are usefulto estimate pollutant concentrations and identify the causes of exceedance ofair quality standards. As the complexity of the analyzed situation increases,the need for data becomes critical and, at the same time, understanding causalrelationships becomes difficult. Therefore, deterministic models tend to fail,and other kind of approach, such as statistical models, is needed. ArtificialNeural Networks (ANN), one of such techniques, have the advantage ofapproximating, with an acceptable degree of accuracy, highly nonlinearfunctions, without requiring prior knowledge about the nature of therelationship between input and output variables. In this work, the uncertaintyin the 24-hr ahead PM10 forecast for the city of Bogotá is analyzed. From the14 automatic stations that measure and record air pollutant concentrations, the“Puente Aranda” station was selected, since it is in one of the Bogotá’s mostpolluted areas and also because it has a robust database (percentage of validdate over 75%) for the period under review (2009-2013). For this study case,the training and validation of ANN used wind speed, ambient temperature,atmospheric pressure, rainfall and relative humidity as input nodes. The outputneuron was PM10 concentration. To propagate the uncertainty in the network, eachinput variable was disturbed by applying the Monte Carlo method, based on itsuncertainty distribution. To assess the predictive ability of the ANN, the DeterminationCoefficient, the Index of Agreement and the Mean Square Error were calculated.As a result, it was found that the variable of greatest weight over the networkarchitecture was wind speed, followed by relative humidity and ambienttemperature.

P4.101 - MULTIPLE LINEAR REGRESION AND PRINCIPAL COMPONENT ANALYSIS FOR PM10 PREDICTION IN BOGOTÁ

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Quality of life in urbanareas, especially in densely populated and industrialized areas is stronglyinfluenced by air quality. In these areas, predictive tools are needed to takepreventive measures against potentially high pollution episodes. Air qualitymodels are one of the most used tools for this purpose, since they are usefulto estimate pollutant concentrations and identify the causes of exceedance ofair quality standards. As the complexity of the analyzed situation increases,the need for data becomes critical and, at the same time, understanding causalrelationships becomes difficult. Therefore, deterministic models tend to fail,and other kind of approach, such as statistical models, is needed.

One of the optionsin the statistical approach is the Multiple Linear Regression (MLR) technique,which has the capacity to estimate the relationships between independent-variables through a linear correspondence. However, when there is multi-co-linearity,the estimation of regression coefficients becomes uncertain. To overcome thislimitation, the Principal Component Analysis (PCA) technique can be used, whichreduces the number of variables and, therefore, the computational cost. In thispaper, a predictive analysis (24 hr ahead) on the PM10 concentration using MLRand ACP techniques over the city of Bogotá is presented. PM10 was chosen becauseof its impacts on human health and its frequent exceedance of air qualitystandards. The potentially explanatory variables were wind speed, ambienttemperature, solar radiation, precipitation, atmospheric pressure and relativehumidity. From the 14 automatic stations that measure and record air pollutantconcentrations, the "Puente Aranda" station was selected because it is locatedin one of Bogotá's most polluted areas, and also because it has a robust database(percentage of valid data over 75%) for the period under review (2009-2013). Asa result, it was found that ambient temperature, humidity and rainfall were significantexplanatory variables. The application of Principal Component Analysis improvedthe performance of the RLM model almost by 10%, the dry season being the periodthat showed the best fit.

Keywords: MultipleLinear Regression, Principal Component Analysis, PM10.

P4.102 - MONTE CARLO 2D FOR THE ANALYSIS OF VARIABILITY AND UNCERTAINTY IN PM10 DISPERSION MODELING

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Variability is true heterogeneity or diversity within a population which cannotbe reduced or eliminated by more or better determinations. However, uncertaintyis ignorance about poor or insufficiently characterized phenomenon, but can bereduced by collecting more data and of higher quality. The objective of thiswork is to estimate the variability and uncertainty in the estimation of PM10concentration caused by the emissions of 8 point sources, located in a cementcomplex located 20km away from Córdoba (Argentina), considering the variabilityand uncertainty of the input variables to the dispersion model. The considered inputswere (i) meteorological variables: wind speed and direction, atmosphericstability and ambient temperature and (ii) emission variables: emission rate, outletgas velocity and temperature. It was developed a routine which uses the ISC-ST (IndustrialSource Complex – Short Term) model dispersion algorithms and the two-dimensionalMonte Carlo methodology (2D MC). This approach, unlike the one-dimensional MC,variability and uncertainty distributions are sampled separately in eachsimulation, so that the variability and uncertainty in the outcome can beevaluated separately. With 105 iterations for variability and 104for uncertainty, it was estimated the PM10 concentrations distribution for the maximallyexposed individual resident (MEIR), previously characterized with ISC-ST model,showing that the uncertainty in the direction and wind speed are the most influentialover the estimates of PM10 concentration. The concentrations distribution shows,with 90% confidence that the median and 95 percentile are below the WHO guidelines.

Keywords: Uncertainty,Variability, Monte Carlo 2D, PM10.

P4.103 - GEOCHEMICAL CHARACTERISATION AND HEALTH IMPLICATIONS OF ATMOSPHERIC ASBESTOS PARTICLES

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Asbestos is worldwide recognized as a public healthproblem due to its carcinogenic potential and for this reason many countrieshave banned their industrial processing and usage. Many localized communitiesworldwide are continuously exposed to Naturally Occurring Asbestos (NOA), inareas for which the potential health hazard is still unknown. Chemical characteristics and composition of atmospheric aerosols (bulk, size-segregated and single particle) were assessed in a specific exposure area of Piên, Paraná State, Southern Brazil, where a large amount of ultramafic rocks (NOA,bearing serpentinite belts and their associated soils) have been used for decades as road paving in rural areas, without awareness of their adverse environmental impact. Inhalable particulate matter was continuously collected at two sites(Crispins' Meadow and Maias' Meadow) over the most traffic demanding countryside road during two-week-long sampling campaigns. The elemental composition of individual particles and bulk PM was analyzed by means of electron probe microanalysis and energy-dispersive X-ray fluorescence, respectively. A large number of the analyzed single particles (~700), were identified as the microfibrillar morphology, consistent with the mineral chrysotile (white asbestos). A lung deposition model estimated the deposition of asbestos atvarious parts of the human respiratory airways. Calculations revealed that most particles gather in the extrathoracic region. Due to the occurrence of inhalable suspended chrysotile near local roads and the long-term exposure, it can apparently trigger an increased risk of lung cancer development in the population of the studied region. This finding indicates that NOA should be recognized and treated as a large-scale environmental health problem, which affects the life-quality and health of the population in developing as well as developed countries. Government authorities need to take geological factors into account to reduce the likelihood of unplanned disturbance of environments containing natural asbestos-bearing materials.

P4.104 - HEALTHY ENVIRONMENT - AIR QUALITY ASSESSMENT OF INDOOR BRAZILIANS ELEMENTARY SCHOOLS NEARBY PETROCHEMICAL INDUSTRY

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Air pollution has been framed as a basic requirement in environmental analysis of indoor and outdoor environments, given its steady increase in recent times. The mitigation of pollution released to the environment originating from the industrial sector has been the aim of all policy-makers and its importance is evident if the adverse health effects on

the world population are considered. Although this concern is controversial, petroleum refinery has been linked to some adverse health effects for people living nearby. Apart from home, school is the most important indoor environment for children and there is increasing concern about the school environment and its impact on health, also in developing countries where the prevalence of pollution is higher. As most of the children spend more than 40% of their time in schools, it is critical to evaluate the pollution level in such environment. In the metropolitan region of Curitiba, South Brazil, five schools nearby industries and highways with high density traffic, were selected to characterize the aerosol and gaseous compounds indoor and outdoor of the classrooms, during 2009-2011. Size segregated aerosol samples were collected for analyses of bulk and single particle elemental profiles.They were analyzed by electron probe x-ray micro-analysis (EPXMA), and by energy-dispersive x-ray fluorescence (EDXRF), to investigate the elemental composition of individual particles and bulk samples. The concentrations of benzene, toluene, ethylbenzene, and the isomers of xylenes (BTEX); NO2; SO2;acetic acid; and formic acid were assessed indoor and outdoor using passive diffusion tubes. BTEX were analyzed by GC-MS and other collected gasses by ion chromatography. Individual exposition of BTEX was assessed by personal passive diffusion tubes. Results were interpreted separately and as a whole with the specific aim of identifying compounds that could affect the health of the scholars. The results shows the high exposure to particulatematter and gaseous from the highways of motor vehicles and industrial plants, indicatingthe anthropogenic sources near to schools. So, one can conjecture that theseaerosols may be a cause of the sources/potentiating respiratory disease in somestudents of the schools.

P4.105 - TOP DOWN ESTIMATES OF BLACK CARBON EMISSIONS IN THE KATHMANDU VALLEY

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Observations in the Kathmandu valley show very high black carbon (BC) concentrations of 5.0-30.6 ug m-3 during the Sustainable Atmosphere for the Kathmandu valley (SusKat) campaign. To investigate factors contributing to this high value of BC during the campaign and further estimate the radiative effect of BC in the atmosphere and in snow, we conduct regional chemistry transport model simulations using the Community Multiscale Air Quality model (CMAQ) driven by meteorology from the Weather Research and Forecasting (WRF) model. In the CMAQ simulation, we use the latest global MOSAIC emission inventory with 0.1x0.1° horizontal resolution from the Hemispheric Transport of Air Pollution version 2. We downscale the global emissions for use on the regional CMAQ domain with 27 km resolution and further redistribute emissions based on the land use data for the nested domain with 1 km resolution for the Kathmandu valley. We conduct model simulations for 23 December 2012 – 10 January 2013 and evaluate the model by comparing with the observations during the campaign. Our comparison shows that the model significantly underestimates the observations by a factor of six in the Kathmandu valley, although the model successfully reproduces background observations at the NCO-P site, indicating that local BC emissions in Kathmandu might be too low in the latest global emission inventory. We apply the factor from the comparison to the a priori BC emission for Kathmandu and yield the a posteriori emission of 1.17 Gg C yr-1 with which the model results in much improved agreement with the observations.

P4.106 - CHEMICAL COMPOSITIONS OF AEROSOLS IN URBAN AND RURAL AREAS OF THREE TAIWANESE CITIES

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Taiwanese cities have certain distinct features such as high population density and dense traffic/commercial/industrial pollution sources. Concentrated air pollutants affect regional climate as well as human health. We conducted a study to assess the differences in aerosol compositions between urban and rural areas in three Taiwanese cities in summer and winter times. The particulate interests are in the compositions of PM2.5 which is classified as human carcinogen.

Intensive sampling and monitoring campaigns were conducted during summer/winter of 2010-2013 in the largest city in the northern, central, and southern Taiwan, i.e. Taipei, Taichung, and Kaohsiung, respectively. Meteorological parameters and the size of aerosols were monitored for 10-14 days. PM2.5 and PM10 samples were collected during 12-hour periods in daytime (8am-8pm) and nighttime (8pm-8am). Major aerosol compositions were analyzed including sulfate, nitrate, ammonium, organic carbon (OC), and elemental carbon (EC). Polycyclic aromatic hydrocarbons and water-soluble organic carbon (WSOC) were analyzed for part of the aerosol samples.

The results showed that the highest PM2.5 concentrations (110±31.1μg/m3) occurred in the winter time in the rural areas of the southern Taiwan. Sulfate concentrations were also higher in the rural area (15.6±6.4μg/m3) than in the city (10.9±4.6μg/m3). Heavy industrial pollution, stagnant meteorological conditions, and lower boundary layers were the main reasons. In addition, in the summer time in the most populated city, Taipei, PM2.5 levels were higher in the rural area (29.0±23.1μg/m3) than in the urban areas (20.5±7.2μg/m3). Pollution transport, biogenic emissions, and potential biogenic-anthropogenic interactions may be the major reason. More data in aerosol compositions will be presented in the conference.
Keywords : organic aerosols, urban pollution, biogenic-anthropogenic interaction

P4.107 - ESTIMATING THE NOX LIFETIME FROM SPACE: CAN WE INFER PLUME CHEMISTRY FROM SATELLITE OBSERVATIONS?

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Satellite observations providevaluable information on sources, transport, and fate of NO2.

For strong and isolated sources, likethe Saudi-Arabian capital Riyadh, it has been demonstrated that the mean NOxlifetime and emissions can be quantified from the analysis of satelliteobservations of the NO2 downwind plume. Distinct outflow patternswere constructed by sorting the satellite observations according to winddirection, and the analysis of Megacity emissions is made possible by the goodspatial resolution of the Ozone Monitoring Instrument OMI.

Here we present strategies foradopting this method to more complex situations, like multiple interferingsources (cities, power plants) within some hundred km, and discuss thepotential and limits for the estimation of NOx emission rates fromspace.

In addition, indications for a changing chemistry(i.e. the instantaneous NOx lifetime) within the plume movingdownwind are investigated.

P4.108 - AMBIENT AIR POLLUTION AND EMISSIONS MEASUREMENTS FROM DOMESTIC SOLID FUEL (COAL) COMBUSTION IN MPUMALANGA, SOUTH AFRICA.

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South Africa is currently in the process of implementing the National Environmental Management: Air Quality Act of 2004. Although the focus in the new act is on the ambient environment, managing emissions at the source remains the most effective manner to reduce the amount of air pollution. Exposure to ambient particulate matter is currently the single biggest challenge to the authorities. Emissions calculations reveal that scheduled industries contribute the biggest fraction of particulate matter to the atmosphere on an annual basis. This, however, is misleading in that if the exposure fraction is taken into account, particulate emissions from domestic fuel burning in townships represent by far the highest health risk to the population. Measurements of air pollution and emissions in a small township, Kwadela in Mpumalalnga, have been conducted during the austral winter (2013 and 2014) and austral summer (2014). Ambient concentrations of PM10, PM2.5 and black carbon have been measured using a BAM and E-bam sampler respectively. Indoor concentrations of respirable PM (less than 4 µm) have been measured using a four TSI Dusttrak 8520 instruments, and exposure to respirable PM has been measured using TSI SIDEPACK AM510 instruments. In addition data from the various particulate monitors have been verified by taking gravimetric samples during the winter of 2014. AMbient and indoor concentrations of Pm are closely linked to the burning habits of the township residents. The indoor respirable PM levels show similar diurnal trends to the ambient measurements except that the concentrations are as much as a factor of 10 higher. Personal exposure data during the daytime show that individuals living in Kwadela are exposed to high PM levels throughout the day.

P4.109 - OBSERVATIONS OF HYDROCARBONS OVER THE CENTRAL HIMALAYAS AND THE INDO-GANGETIC PLAIN: SEASONAL VARIATIONS AND RELATION WITH OZONE CHEMISTRY

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Methaneand Non-Methane Hydrocarbons (NMHCs) play vital roles as the precursors of keysecondary pollutants such as ozone and secondary organic aerosols influencing theair quality and climate. Despite of this, in situ measurements of hydrocarbonsare very limited over the northern Indian region including the denselypopulated and polluted Indo-Gangetic Plain (IGP). In light of this, first 3-yearobservations (2009-2011) of CH4 and light (C2-C5)NMHCs are analyzed from a regional representative site Nainital (29.40N,79.40E, 1958 m) in the central Himalayas and two nearby sites in theIGP.

Seasonalvariation in Methane shows a maximum (~ 1.89 ppmv) during the late autumn/earlywinter, while it decreases towards spring and attains minimum (~1.79 ppmv)during summer-monsoon at Nainital. The seasonal variations in NMHCs are similarto that

in methane. The seasonal variations in NMHCs are not very pronounced overthe IGP however the levels are higher by a factor of ~1.5 as compared to thoseover the central Himalayas. The accumulation of pollutants and transport fromnorthwest is suggested to drive the observed autumn-winter maximum whilesummer-monsoon minimum is attributed to the arrival of marine air mass. Theethane/propane and i-butane/n-butane ratios indicate the influence from biomassburning, LPG and natural gas during spring and autumn at Nainital. The C2H2/COratio, indicator of photochemical age of the air mass, are estimated to be 0.5,0.95, 0.06 and 1.68 pptv/ppbv at Nainital during winter, spring, summer andautumn respectively. This suggests that the site receives well aged air masses duringwinter and summer while the site is influenced by moderately fresh emissions duringspring and autumn. Relatively poorer correlations of CO with ethane and propaneindicate that vehicular exhaust emissions are not the dominant sources atNainital. These observations have also been compared with a high altitude sitein the western India and several remote global high altitude sites. A chemicalbox model (NCAR Master Mechanism) is being used to understand the contributionof NMHCs in ozone photochemistry at Nainital. More detailed discussion will bemade during the presentation.

P4.110 - ON THE SOURCES OF NITROUS ACID IN A POLLUTED SUBTROPICAL ENVIRONMENT: OVERVIEW OF RESULTS FROM THREE SITES IN HONG KONG

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Nitrous acid (HONO) plays an important role in the chemistry of polluted atmosphere, but its sources in different environments are not well understood. Here we give an overview of recent measurements of HONO at three sites (one sub-urban, one coastal background, and one mountain top) in Hong Kong which is situated on the South China coast. The data are examined to elucidate seasonal characteristic, emission factors, and rates of heterogeneous production. Elevated concentrations of HONO (several hundreds ppt to over 1 ppb) were observed during daytime at these sites. At the suburban site which is impacted by vehicular emissions, the HONO and NOx peaked in rush hours indicative of direct emissions. The emission factors of HONO(HONO/NOx) were inferred in 13 fresh plumes and were in the range of 0.3% -1.8% which is in contrast to the more uniformed value of 0.8% reported in literatures. The variable emission factors are attributed to the reaction of NO2on black carbon or VOCs emitted from vehicles, based on strong positive correlation between HONO/NO2 and concurrently measured black carbon. The rates of heterogeneous reactions of NO2 to HONO on ground surfaces are derived from night-time data, which show higher rates on sea surface compared to ground. For the selected episodes, the strengths of the ‘unknown’ daytime source were estimated with the PSS assumptions and were correlated with proxies of ground and atmospheric aerosol. The results appear to suggest that aerosol surface could play a more important role in HONO production than ground when aerosol loading and humidity is high. Model calculations confirmed important contribution of HONO to the OH radical budget throughout the day. This study highlights the need to better represent/parameterize emission and surface related processes for OH in order to accurately simulate photochemistry in the lower part of the atmosphere.

P4.111 - TRACKING THE SOURCES OF TROPOSPHERIC OZONE

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Tropospheric ozone is a harmful pollutant with adverse effects on human health and ecosystems. As well as these effects, tropospheric ozone is also a powerful greenhouse gas, with an anthropogenic radiative forcing one quarter of that of CO2. Along with methane and atmospheric aerosol, tropospheric ozone belongs to the so-called Short Lived Climate forcing Pollutants, or SLCP. Recent work has shown that efforts to reduce concentrations of SLCP in the atmosphere have the potential to slow the rate of near-term climate change, while simultaneously improving public health and reducing crop losses. Unlike many other SLCP, tropospehric ozone is not directly emitted, but is instead influenced by two distinct sources: transport of air from the ozone-rich stratosphere; and photochemical production in the troposphere from the emitted precursors NOx (oxides of nitrogen), CO (Carbon Monoxide), and VOC (volatile organic compounds, including methane).

Better understanding of the relationship between ozone production and the emissions of its precursors is essential for the development of targeted emission reduction strategies. Several modeling methods have been employed to relate the production of tropospheric ozone to emissions of its precursors; emissions perturbation, tagging, and adjoint sensitivity methods all deliver complementary information about modelled ozone production. Most studies using tagging methods have focused on attribution of tropospheric ozone production to emissions of NOx, even though perturbation methods have suggested that tropospheric ozone is also sensitive to VOC, particularly methane.

In this set of studies we examine the attribution of tropospheric ozone to emissions of VOC using a tagging approach, whereby each VOC oxidation intermediate in model chemical mechanisms is tagged with the identity of its primary emitted compound, allowing modelled ozone production to be directly attributed to all emitted VOCs in the model. Using a global model we examine the spatial and temporal extent of NOx-limited and VOC-limited regions with respect to ozone production chemistry, and we explore the sensitivity of the attributed ozone production to choices made during the tagging of the chemical mechanism. Using a regional model, we explore the extent to which transported VOC oxidation intermediates can be responsible for ozone production downwind of the original emissions source. Using a box model, we perform a detailed comparison of chemical mechanisms, examining the degree to which the explicitness of the representation of VOC oxidation intermediates influences the ozone production potential of VOC under idealised conditions. We also investigate uncertainties in the speciation of VOC emissions, as represented in state of the art emission inventories, and examine the extent to which these uncertainties can influence modelled ozone production. The representation of the emission of biogenic VOCs (BVOC) in our models is also improved. In particular, we implement a relationship between ozone stress and increased BVOC emissions. This is expected to be particularly important for urban trees. Based on the results of these studies, we recommend emission control measures based on their effectiveness in mitigating ozone air quality and climate forcing.

P4.112 - ROAD PAVING AND ROAD TRAFFIC CONTRIBUTION TO PM (1,0 AND 2,5), BLACK CARBON AND PAH CONCENTRATION DURING REAL WORLD MEASUREMENT.

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Road traffic and road paving are two of the main sources of particulate matter and PAH in the atmosphere. The assessment of the emission of these sources to the atmosphere is essential for evaluate hazards even to the environment as for public health. Through the objective of getting the real world emission of pollutants in a highway build case, this paper investigates particulate matter, black carbon and 16 PAHs in PM1,0 and PM2,5 size fractions in a real coal tar based sealant step of PR-445 highway duplication rebuild, specifically at 23.330328°S and 51.187035°W. Surveyed by each 24 hours, since September 20 2013 to September 29 2013, four cyclones systems (duplicate analysis) were employed by drawing air using 47mm glass fiber filters with a 1.5 µm pore size at a 16.7 L min-1 constant flow rate, placed at 3 meters length and 3.5 meters height across the highway. Vapor-phase PAHs were collected using two SKC cartridges packed with XAD-4 resin at 2.0 L min-1. Meteorological data during each sampling period were obtained from the State Meteorological System (SIMEPAR). The PM mass was obtained using an analytical Microbalance Metter (Metter Toledo AX26) with 1 µg sensitivity. Gravimetric analysis was performed weighing filters before and after sampling. In order to control humidity, filters were conditioned for 24 hours. For black carbon analysis, the filters were examined measuring the reflectance with an EEL 43D Smoke Stain Reflectometer (Diffusion Systems Ltd., London, UK). Filters and resin were extracted with acetonitrile and methanol mixture (1:1) using ultrasonic agitation. The extract volumes were reduced to 2 mL and the PAH concentrations were determined by HPLC-UV-FLU (Dionex Ultimate 3000) in comparison with a standard certificate (Supelco, Bellefonte, PA, USA). The mass concentration determined average was 11.6 µg m-3 (5.6 to 20.5 µg m-3) for PM1.0 and that of PM2.5 was 13 µg m-3 (6.3 to 24 µg m-3). For black carbon the concentration average obtained was 9.17 µg m-3 (8.6 to 15.7 µg m-3) for PM1,0 and 8.64 µg m-3 (4.53 to 15.05 µg m-3) for PM2,5. The results were compared with literature and guideline values.

P4.113 - DIURNAL SPATIAL VARIATION OF TRAFFIC POLLUTANTS THROUGHOUT TWO URBAN HIGHWAY COMMUNITIES

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Concentrations of primary traffic pollutants are known to fluctuate substantially depending on traffic conditions, meteorological factors and the physical characteristics of the location. Subsequently, fixed-site monitors are largely inadequate for estimating concentrations at nearby locations unless multiple monitoring stations are in place. Less expensive options include networks of cheap passive samplers, spatial modelling or mobile sampling methods. Many mobile sampling studies use a vehicle to monitor concentrations along a random route, repeating the trip once or twice only. In this study we present a spatial saturation sampling method and novel analysis to illustrate variation throughout the day using 3D concentration plots atop satellite imagery. Ultrafine particles (UFPs), carbon monoxide (CO) and particulate matter (PM10) were measured at 1-second intervals across 20 runs in each highway community, conducted at four different times of day

(07:00, 12:00, 17:00 and 22:00) riding a bicycle. Results show that the spatial influence of UFPs and CO downwind of the highways is greatest during early mornings and very late at night (up to 650 m), coinciding with cool temperatures and low wind speeds. During the day (12:00, 17:00), there was virtually no emissions signal just a few metres from the highways. Instead, high winds fed emissions into street canyon areas, where the highest concentrations were consistently recorded. Unlike UFPs, a degree of spatial uniformity was evident for PM10 and CO concentrations in residential areas late at night and early in the morning, indicative of wood burning to heat homes. This study not only provides an insight into spatial variation of urban air quality, but also how this variation shifts diurnally.

P4.114 - TOWARDS REAL-TIME, FULL COVERAGE MONITORING OF PM2.5 OVER CHINA BY COMBINING SURFACE AND SATELLITE OBSERVATIONS WITH HIGH RESOLUTION NUMERICAL SIMULATIONS

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In recent years China experienced severeair pollution (especially PM2.5) crisis. Though more than 1,000surface PM2.5 observation stations have been established across the nation since recent few years, there are still huge data void areas where half billion people live. Towards real-time, full coverage monitoring of PM2.5over China, an advanced PM2.5 data assimilation system was established to combine surface, satellite observationswith numerical simulations. This approach allows taking advantages of different information: high frequency station observations that represent the local surface PM2.5 concentrations, satellite observations that have more extensive spatial coverage and numerical simulations that can consider the influences of emission, deposition and transport processes etc. This approach can deliver not only PM2.5 concentration estimations with full spatial and temporal coverage, but also can provide uncertainties of estimations.

In a case study of the severely polluted period of January 2013, surface PM2.5observations from more than three hundreds stations were assimilated into a 3-dimensional air quality model to estimate the spatial distribution of PM2.5 concentrations over whole China. The main findings are (1) over 25% of land areas in China where 72% of total population live, the monthly averaged PM2.5 concentrations exceedμg/m3, which posed a serious health threat to most Chinese people. (2) Besides the North China Plain (NCP), the northeastern China (NEC) and Chengdu-Chongqing region (CCR) also reached dangerous levels of PM2.5,which suggested the air pollution control of China should not regularly focus on the three super city-clusters, i.e., Beijing-Tianjin-Hebei, Pearl River Delta, Yangtze River Delta areas, but also be paid to NEC and CCR where the airquality was regarded as “not so bad” before.

In our future plan, the satellite observations will also be assimilated into a higher resolution version of the model for high resolution monitoring of PM2.5 over China. The assimilation dataset can also be used for model validation, process studies and health impact studies.

Keywords: PM2.5 observations, data assimilation, China

P4.115 - URBAN PLUME ENHANCES PARTICULATE SULFATE FORMATION: OBSERVATION FACT DURING EARLY SUMMER IN NANJING SORPES STATION, 2012

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Secondary sulfate production is considered to be an important process in air pollution chemistry and radiation balance in the atmosphere. In an intensive observation campaign focusing on PM2.5 characteristics conducted at the early summer of 2012, sulfate and other PM2.5 chemical compositions as well as the gas precursors were measured continuously for over two months. The sulfate was found to be a main contributor to the PM2.5 mass, which frequently exceeded the national ambient air quality standard during the campaign. The cluster analysis of backward trajectories shows clearly the PM2.5 pollution was mainly attributed to regional emissions under poor dispersion conditions while hazardous biomass burning (BB) events were observed as well. High sulfate oxidation rate was found in both of the two high PM2.5 situations making sulfate important for the formation of PM2.5 pollutions. According to the observation fact of a case with high construction dust, the gaseous formation of sulfate was enhanced by nearly 30% compare to common situation. Meanwhile, heterogeneous oxidation of SO2 by NO2 on the surface water was considered to be the cause of the sharp increase of sulfate and a possible source of HONO in a case of biomass burning emission mixing with urban plume. This work shows the urgent need of further investigation of urbanization and intensive anthropogenic activities like biomass burning for the control of worsening air quality in east China.

P4.116 - DOES AIR POLLUTION MONITORING DATA NECESSARY TO PREDICT HEALTH IMPACTS?

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Researches comprisingair pollution health impacts usually are feasible in areas with air pollutants monitoringnetworks. Then, there is a lack of researches in areas with no monitoring data,a common situation in Brazil. In this research, we propose a methodology tolink atmospheric pollutants dispersion outputs with health impact assessment, usingalready established tools, aiming the development of air pollution healthimpact researches in areas with no air pollution monitoring data and, also topredict the health impacts of new industries or changes of technology. As a casestudy, this methodology was applied to Campinas city in São Paulo State, Brazil.Hospital admissions for respiratory diseases data from 2007 to 2008, togetherwith atmospheric pollution dispersion simulation to carbon monoxide (CO) andparticulate matter with aerodynamic diameter less than 10mg/m3(PM10) were used to predict 2009 trimestral air pollutionrespiratory impact. The dispersion of CO and PM10 were simulatedusing the AERMOD model (American Meteorology Society – EnvironmentalProtection Agency – Regulatory Model) developed by U.S.EPA. To validate the proposed methodology, theresults were compared to the impact assessment held using monitoring data. Theresults showed that the relative risks (RR) using dispersion data were veryclose to those using monitoring ones. The 2009 trimester predictions showed amaximum difference in relation to measured data of 24% to CO and of 35% to PM10.As there are many other factors that may lead to hospital admissions, these areconsidered good results. We may conclude that the proposed methodology has abroad appliance and can lead to a new research field in air pollution healthimpact area.

P4.117 - GLOBAL AND REGIONAL IMPACTS OF HONO ON THE CHEMICAL COMPOSITION OF CLOUDS AND AEROSOLS

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Recently, realistic simulation of nitrous acid (HONO) based on the HONO/NOx ratio of 0.02 was found to have a significant impact on the global budgets of HOx (OH+HO2) and gas phase oxidation products in polluted regions, especially in winter when other photolytic sources are of minor importance. It has been reported that chemistry-transport models underestimate sulphate concentrations, mostly during winter. Here we show that simulating realistic HONO levels can significantly enhance aerosol sulphate (S(VI)) due to the increased formation of H2SO4. Even though in-cloud aqueous phase oxidation of dissolved SO2 (S(IV)) is the main source of S(VI), it appears that HONO related enhancement of H2O2 does not significantly affect sulphate because of the predominantly S(IV) limited conditions, except over eastern Asia. Nitrate is also increased via enhanced gaseous HNO3 formation and N2O5 hydrolysis on aerosol particles. Ammonium nitrate is enhanced in ammonia-rich regions but not under ammonia-limited conditions. Furthermore, particle number concentrations are also higher, accompanied by the transfer from hydrophobic to hydrophilic aerosol modes. This implies a significant impact on the particle lifetime and cloud nucleating properties. The HONO induced enhancements of all species studied are relatively strong in winter though negligible in summer. Simulating realistic HONO levels is found to improve the model-measurement agreement of sulphate aerosols, most apparent over the US. Our results underscore the importance of HONO for the atmospheric oxidizing capacity and corroborate the central role of cloud chemical processing in S(IV) formation.

P4.118 - NEURAL NETWORK APPROACH TO IDENTIFY NH3 EMISSIONS FROM BIOMASS BURNING

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Ammonia (NH3) emission is one of the greatest environmental concerns, undermining agricultural and ecological sustainability worldwide. Satellite monitoring of ammonia from space can improve our understanding of the global nitrogen cycle. Recently the Infrared Atmospheric Sounding Interferometer (IASI), using a retrieval method developed at the Université Libre de Bruxelles (ULB), has shown its ability to monitor NH3 global distributions and trends with high temporal and spatial resolution.

While livestock wastes and fertilization of crops contributes more than 50% on the global emission of NH3, biomass burning alone contributes to around 16%. To better identify the principal factors facilitating NH3emissions on a global scale, it is necessary to remove the biomass burning contribution from the NH3 total columns observed. As a screen on the basis of fire counts does not account for transport, a non-parametric tool

(a hybrid neural network combining unsupervised and supervised neural network), has been created to partition NH3 total columns measured from IASI. The neural network is based on the simultaneous observations of NH3, CO, HCOOH, C2H2 and C2H4 from IASI and NO2 from GOME-2.

The first results on a global scale will be shown.The performance of the neural network is assessed by comparing spatially and temporarily the biomass burning's NH3 fraction with MODIS fire data. A temporal analysis of the non-pyrogenic NH3 fraction is also performed in order to identify potential sources of ammonia over different selected sites. More specifically, we evaluate the capabilities of the neural network to discriminate emissions from four different sectors: biomass burning,agriculture, anthropogenic combustion and vegetation.

P4.119 - TEMPORAL VARIATION OF PARTICULATE POLYCYCLIC AROMATIC HYDROCARBON CONCENTRATIONS IN NORTHEAST ASIA

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We investigated the temporal variation of particulate phase polycyclic aromatic hydrocarbon (PAHs) concentrations in Northeast Asia, using the aerosol chemical transport model, Regional Air Quality Model version 2 for Persistent Organic Pollutants (RAQM2-POP ver2). The emission inventory, Regional Emission Inventory in Asia for POPs version, REAS-POP ver2, was updated to investigate the recent temporal and spatial variation for the period from 2000 to 2008.

China was the largest particulate phase PAHs emission country, which contributes to more than 95% of total emission in the northeast Asia. The emission of PAHs was rapidly increased with clear seasonal variation, low in summer and high in winter in China. The areas of highest emissions were in China, especially in eastern China, Chongqing, Sichuan province. The increased emission was significant in eastern China. Annual emissions of 9PAHs were increased to 1.4 times during the period from 2000 to 2008. Emission in winter season (December) was 1.3-1.5 times higher than those in summer season (July).

By using RAQM/REAS-POPs ver2, we investigated the temporal variation of particulate phase PAH concentrations at Noto site, Japan. This site is located to the coastal site of Sea of Japan and effective to investigate the transboundary transport of particulate phase PAHs in northeast Asia. At the Noto site, particulate phase PAH concentrations are clear seasonal variation with high in autumn-spring and low in summer from September 2004 to March 2008. The highest concentration was observed in March 2008 during this period.

P4.120 - IMPACTS OF ADDITIONAL HONO SOURCES ON O3 AND PM2.5 CHEMICAL COUPLING AND CONTROL STRATEGIES IN THE BEIJING-TIANJIN-HEBEI REGION OF CHINA

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The objective of this work is to examine the impacts of additional HONO sources on the chemical interaction between ozone (O3) and particulate matter with a diameter less than 2.5 μm (PM2.5).Three additional HONO sources, i.e., HONO emissions, the reaction of photo-excited nitrogen dioxide (NO2*) with water vapor (H2O),and NO2 heterogeneous reaction on aerosol surfaces, were inserted into the fully coupled Weather Research and Forecasting-Chemistry (WRF-Chem) model to evaluate O3 and PM2.5 concentration enhancements in the Beijing-Tianjin-Hebei (BTH) region during August of 2007. Results show that the additional HONO sources significantly increase O3 and PM2.5 concentrations during daytime. Up to 9 ppb enhancements of O3 and 32 μg m-3 increases in PM2.5 are found at seven urban sites over the BTH region. O3 increases are closely connected to PM2.5 increases during daytime when the additional HONO sources are considered. The correlation coefficient between O3 and PM2.5 daytime enhancements is greater than 0.8 in many urban areas. The enhanced O3 and PM2.5 chemical coupling due to the additional HONO sources is related to the increasing OH which promotes O3 and particulate matter production simultaneously.The concentration variations of O3 and PM2.5 under a variety of NOx, volatile organic compound (VOC) and ammonia (NH3) emission control scenarios show that the additional HONO sources increase the sensitivity of O3 and PM2.5 concentrations to the changes of NOx emissions. An increase of the PM2.5 sensitivity to changes in NH3 emissions is also found. This indicates that without considering the additional HONO sources, the effectiveness of emission control strategies in reducing O3 and PM2.5 concentrations would be underestimated significantly.

P4.121 - CHARACTERISTICS OF GASEOUS POLLUTANTS AT A RURAL SITE OF BEIJING DURING THE PERIOD OF 2006-2008

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Gaseouspollutants, SO2, NO, NO2, NOX, CO, and O3were observed at a rural site south of Beijing, named Yufa. During the period ofAugust 2006 to October 2008 the average concentrations of SO2, NO, NO2, NOX,CO, and O3 are 13.74±15.89ppbv,11.14±24.25ppbv, 23.14±17.99ppbv, 33.31±36.15ppbv, 1.53±1.78 ppmv ,27.22±27.02 ppbv,respectively.Theconcentrations ofthese gaseous pollutantshave significantly seasonal variation.The concentrations of SO2, NO, NO2, NOX, COare higher in winter and lower in summer, while that of O3 shows areverse tendency. Time series of gaseous pollutants concentrationsshow “saw-toothed”variation, indicating that the meteorological conditions (especially wind and precipitation)play an important role in determining the air quality of this site. The airstagnation with low wind speeds and no precipitation favor the gaseouspollutants accumulate. While the strong northerly wind and precipitationproducing the low gaseous concentrations.

Theaverage diurnal variations of gaseous pollutants concentrations andmeteorological element (e.g. relative humidity, temperature, wind speed) werecalculated according to seasons. For NO, NOx, and CO, thediurnal variations are much more significant in winter than in other seasons,while the lowest diurnal amplitude is found in winter for O3.Theconcentration maxima of NO, NOx, and CO appear in the morning 6:00-8:00LT and the minima at13:00-16:00LT.The diurnal patternsof O3for all seasons are similar,with minima and maxima in the period of 4:00-6:00LT and 14:00-16:00LT,respectively.The diurnal variations of SO2and NO2 aremorecomplicate and inconsistent with those of NO, NOx, and CO.

P4.122 - SOLUBLE METALS IN ROADSIDE AEROSOL INDUCE PRO- AND ANTI-OXIDATIVE EFFECTS: A CASE STUDY IN THREE EUROPEAN ROADWAYS

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Particulate matter (PM), mainly from traffic and industrialemissions, is implicated in adverse health effects, mostly through induction ofoxidative stress. We investigated the causativerole of soluble metals in atmospheric PM in inducing pro- and anti-oxidativecellular responses (ROS production and ARE-mediated antioxidant/phase II geneexpression, respectively). We evaluated the ROS production and ARE promoteractivity in alveolar macrophages and bronchial epithelial cell lines uponexposure to water extracted from PM samples collected in three roadwise sites in Europe. The cells wereexposed to total extracts, filtered and extracts following removal of metals by chelation. Differences in ROS activity andARE-luciferase promoter activation between the locations were observed. Sampleswith higher levels of metals had higher ROS and ARE activations as compared to asample with lower levels of metals. Filtration decreased ROS activity in thecoarse mode extracts but not in the fine extracts, suggesting that fine PM ROSactivity is attributed to the soluble fraction of PM. In the sample with lowermetal levels, the ROS activity in both fine and coarse extracts was caused bynon-soluble PM species, while the ARE-Luc promoter activities in both fractionswere reduced by filtration, suggesting that ARE-Luc promoter activity is causedby soluble aerosol components. Chelation showed that soluble metals are majorfactors mediating ROS and ARE-Luc activities of the soluble fraction. Statisticalanalysis revealed a small subset of water-soluble metals (Fe, Zn and As) aspotential ROS-active PM species. Zn and As have been implicated in the ARE-Lucactivation. These finding imply on the role of specific soluble PM metals inboth of pro-oxidative and anti-oxidative effects of PM in the respiratory tractand suggest that common PM features, i.e. soluble PM metals, mediates theinduction of ROS production as well as ARE-Nrf2 mediated gene expression.

P4.123 - DETERMINATION OF THE CONCENTRATION OF IONS IN PARTICULATE MATTER (PM10 AND PM2, 5) ATMOSPHERIC AIR AN URBAN AREA CITY NATAL/ RN – BRAZIL

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The Natal city (Rio Grande do Norte - Brazil) isa city in full socio-economic development, thereby helpingto increase the level of atmospheric emissions in urban areas. The sources ofair pollution can be natural, such as volcanic eruptions, dust and “sprays”marine or anthropogenic, such as the burning of fossil fuels and industrialprocesses. This study aimed to assess the air quality of an urban area of??Natal (latitude 5º49’29’’ south and longitude 35º13’34’’ west), in order todetermine the concentration of ions in Particulate Matter (PM10 e PM2,5)atmospheric air. Samples were collected on glass fiber filters by means of twosamplers large volumes (AGV PM2,5 e AGV PM10). Theconcentrations of particles ranged from 8.92 to 19.80 mg.m-3 for PM10and PM2,5 from 2.84 to 7.89 mg.m-3. The sampled filters weresubjected to mechanical extraction and then the aqueous extracts were analyzedby ion chromatography. It was determined the cations sodium, potassium,magnesium and calcium and of the anions chloride, sulfate, nitrate andphosphate. The cations Na+, K+, Mg2+ e Ca2+ranged from 0.005 to 0.241 , 0.042 to 0.059 , 0.010 to 0.021 and 0.032 to0.062 mg.m-3 respectively. Since the concentration of the anions Cl-,SO42-, NO3-, PO42-ranged from 0.663 to 6.592, 0.064 to 0.797, 0.011 to 0.049 and 0.005 to 0.018 mg.m-3 respectively.

P4.124 - DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOCS) IN ATMOSPHERIC AIR OF THE CITY OF NATAL-RN/BRAZIL

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Inthis study, an assessment of the air quality was conducted in the vicinity of (CTGAS-ER) Centre for Gas and Renewable Energy Technologies located in Natal, RioGrande do Norte, Brazil . This study aimed to identify volatile organiccompounds (VOCs) present in the atmospheric air around the CTGAS -ER. The analysis of VOCsin the atmosphere was performed using the technique of gas chromatography withmass spectrometric detection (GC- MS), following the method of reference EPATO- 15. Samples were collected through canister within 8 hours. After airsampling, the material collected in the canister is analyzed in the laboratory,which is initially connected to a flow meter and a tube of adsorption. A samplevolume is passed through the adsorber tube that concentrates the VOCs. Theanalytical system performs the removal of moisture retained in the adsorptiontube, heating it and injecting the vapors and gases into the chromatograph.Among these compounds were identified in the presence of higher proportionsaldehydes and acetic acid in atmospheric air.

P4.125 - ATMOSPHERIC OH REACTIVITY MEASUREMENTS IN BEIJING, CHINA DURING SUMMER 2013

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Ambienttotal OH reactivity was measured at Peking University, an urban site in Beijingduring August 2013 by applying the Comparative Reactivity Method(CRM) coupledto a PTR-MS detector. The campaign average total OH reactivity was 19.7s-1,which is lower than average value reported from Mexico City(33s-1)and Tokyo(40s-1), but higher than those of New York(19s-1),Houston(15s-1) and Mainz(10.4s-1) in the same season.Daytime maximum ozone and NMHC mixing ratios show the same order ofconcentration between these megacities as reactivity. Previous OH reactivitymeasurements in two rural sites(Yufa near Beijing and Backgarden in PRD) viaLaser Induced Fluorescence (LIF) method presents similar reactivity and NMHClevels. Reactivity measurements varied from below detect limit to over 200s-1.On clean days little diel variation was discernable, whereas on more polluteddays reactivity varied between 25-30 s-1 at night and 10-15 s-1in the daytime. Inorganic trace gases as CO, NOx, SO2 andC2-C12 hydrocarbons as well as some oxygenatedVOCs(OVOCs) were simultaneously measured via GC-MS and other instruments.Comparison between directly measured reactivity and calculated reactivity showa ration of 1.19, indicating that circa 20% of the reactivity was unexplained.NOx, NMHCs and OVOCs contributed 30%, 29% and 16% to the measuredreactivity, respectively. This discrepancy(missing reactivity) was also maximumin the morning rush hour, when there were significant increases in the mixingrations of 1,3-butadiene and MTBE, both of which are known to be strongemission from vehicles. This discrepancy may in part be explained bycontribution from several important alkenes from C4 to C6, whichwere not measured here, but that have reached a summed reactivity of 3s-1,during a previous campaign in the same season in Beijing. Short term incidencesof higher missing reactivity were also observed indicative of local, strongspecific sources.

P4.126 - OBSERVED URBAN AIR POLLUTION IN RUSSIA AND ITS INFLUENCE ON ATMOSPHERIC CHEMISTRY

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Urban air pollution is actual topic because of its influence on air quality and climate processes on both regional and global scale. There is a lack of up-to-date information about real state of air quality in Russian cities because of very few contemporary observations. Obukhov Institute of Atmospheric Physics possesses significant database of automated

measurements of air composition including data of train-based TROICA experiments in 1995-2010 and of permanent observations in since general numerous crosses of about 100 urban settlements of different size and location have been performed that allowed us to compose detailed pattern of urban air pollution in nowadays.All cities were separated at three groups: megacities (more then 500 000 citizens), middle cities (50 000-500 000 citizens) and little towns (less then 50 000 citizens). Each urban settlement has been divided into railway station area, urban zone and city (or town) surroundings. Concentrations of main polluting gases (NO, NO2, CO, SO2, NMHC, O3) and aerosols have been averaged for each settlement as well as for each group of urban settlements for day and night, and for winter and summer.Main features of air urban pollution in are presented. Variations of main pollutants including anthropogenic VOCs because of daytime and seasons, as well as temperature vertical structure are studied. Concentrations of O3, CO, SO2 and NMHC are usually below MPC level. NO2 is often enhanced especially near auto-roads. In general, polluting gases have greater concentrations in winter time due to heating and stronger temperature inversions. Particulate matter is likely to be the most persistent pollutant that determines more than 90% of pollution cases.Air quality level was assessed on base of new approach elaborated at OIAP to assess air quality in Russian cities. It accounts for both world famous methods and official Russian legislation. General level of air pollution in Russian cities is low or moderate mostly due to favorable location and climate conditions. Extreme concentrations can happen in warm period because of wild and anthropogenic fires and other severe pollution cases. Influence of urban pollution on regional chemistry is considered as well.

P4.127 - CHARACTERIZATION OF FINE AND ULTRAFINE AEROSOLS AT AN URBAN ENVIRONMENT OF CÓRDOBA CITY, ARGENTINA

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Atmospheric aerosols are amongthe most important classes of atmospheric pollutants and many published worksin the literature confirm the fact that particles with small sizes have seriousimpacts on human health. Size and chemical composition are two of the main parametersthat affect the way those particles correlate with population health. Theincreasing evidence indicating that fine particulate matter in the atmosphereis responsible for adverse effects on humans led to the imposition ofregulatory restrictions on PM2.5. Thus, the United States adopted the NationalAmbient Air Quality Standard, which sets the limit to 35 μg m−3 while theEuropean Union legislation for air quality established a 24-hour limit value of25 μg m−3. Unfortunately, for Argentina a 24-hour limit value for PM2.5 has notbeen set.

In this work, PM2.5 sampling was conducted for the period April 2010 to December2011 at an urban site of Córdoba City. The observed average concentration valuewas of 50 μg m−3, which exceeds the limits set for this pollutant. Besides, thecollected samples were individually analyzed for elemental composition byenergy-dispersive Synchrotron Radiation X-Ray Fluorescence spectrometry toobtain elemental mass concentrations with the goal of addressing thecontribution of the toxic metals to the fine aerosols. The data set allows acomprehensive analysis of particulate matter, giving information on temporalvariations of PM2.5 mass concentration and chemical composition. The speciationfound in this aerosol fraction is used to explore the sources responsible forthe PM levels as well as their seasonal dependence applying a receptor modelanalysis to the measurements. Four sources were identified: traffic (33.9 %),secondary aerosols/biomass burning (35.1 %), mineral dust (15.3 %) and industry(15.7 %).

In addition, from May to August2011, aerosols were collected in two additional size fractions (PM0.25-0.5,PM0.5-1) to investigate the toxic metal contributions to the finer fractions. Itwas found that toxic metals make an important contribution to the finest sizefraction.

The results of this work are important evidencepointing out to the urgency to start working on the drafting of pertinentregulations.

P4.128 - POLLUTANT TRANSPORT MODELING FOR A TROPICAL INTER-ANDEAN REGION WITH CCATT-BRAMS: BOGOTÁ CASE STUDY

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This work studies the transport and dispersion of air pollutants emitted by Bogotá, a megacity located over a wide plateau, immersed in the eastern branch of the three Colombian branches. Meteorology features defined by the city's location at low latitude with a complex surrounding terrain, together with their influence on the behavior of air pollutants, are a challenging issue that needs to be overcome in order to implement air quality modeling as a management tool in the city. The Coupled Chemistry Aerosol-Tracer Transport model to the Brazilian developments on the Regional Atmospheric Modeling System (CCATT–BRAMS, version 4.5) was tested using two approaches; first, by including emissions from refined global datasets EDGAR and RETRO; and second, by including updated high resolution air pollutants emission inventories for Bogotá. An experimental domain of three square nested grids of 40 vertical levels with 104, 202, and 332 grid points for resolutions of 25km, 5km and 1km respectively were established. Hourly results for meteorology variables and carbon monoxide as a gaseous tracer were compared with observed data for a dry season episode. Model evaluation tools were applied, using common statistics and graphical representations implemented in the OpenAir package. Overall results show plausible model performance. Results for spatial and temporal distribution of pollutants show an improved representation when high resolution inventories are applied.

P4.129 - SEASONAL TRANSPORT OF PAN FROM CHINA USING AURA TES PAN RETRIEVALS

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Long range transport of pollution from China depends on the conversion of surface NOx emissions into Peroxyacyl Nitrate or PAN and subsequent global transport of PAN in the free-troposphere where it is stable because of cold temperatures.Once PAN subsides into the warmer lower troposphere it is converted back into NOx which can in turn form ozone. In this presentation we use new PAN retrievals from the Aura TES instrument to characterize the seasonal cycle of free-tropospheric PAN from Asian emissions and its subsequent transport to North America.

P4.130 - MEGACITIES AND LARGE URBAN COMPLEXES: NEXT PHASE OF THE GURME PROJECT

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Global urbanization has become an irreversible trend with 23 megacities projected for 2015 worldwide, amongst which 18 are coastal cities and many in the emerging countries. Urbanization alters many surface parameters such as roughness, albedo or permeability, which propagate to the atmosphere in terms of changes to turbulence intensity, stability, mixing height, etc. This leads to phenomena specific to the urban environment such as heat islands, enhanced flooding risk, channelling of wind, etc. Combined with particulate and gaseous emissions it further alters the atmospheric state and composition, including through the formation of condensation nuclei, increase turbidity, decrease radiation and visibility, exacerbation of air pollution... The mountainous terrain/sea interface in most coastal cities adds to the complexity of understanding and predicting in urban environments which also evolve under, respond, and contribute to climate change. The significant technical, social and environmental stressors is driving the demand for more accurate environmental assessments and prediction services based on urban meteorology and addressing an expanding range of urban environmental concerns such as hydrological and water resources in addition to air quality and health related issues. The presentation will focus on recent accomplishments and future plans for GURME/megacities.

P4.131 - MONITORING SHIPPING EMISSIONS WITH MAX-DOAS AND IN-SITU MEASUREMENTS OF TRACE GASES

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Air pollution from shipping emissions contributes to overall air quality problems and has direct health effects on the population especially in coastal regions and harbor cities. In order to reduce these emissions the International Maritime Organisation (IMO) has tightened the regulations for air pollution from ships. For example Sulfur Emission Control Areas (SECA) have been introduced where the sulfur con

P4.132 - POLLUTION OBSERVATION FROM 20 YEARS OF MOZAIC/IAGOS AIRCRAFT MEASUREMENTS: CONNECTIONS FROM REGIONAL TO GLOBAL SCALES

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Since 2001, MOZAIC-IAGOS (http://www.iagos.org/)daily flights observe pollution by measuring carbon monoxide (CO) at highspatio-temporal resolution, in different key areas around the world. This studyshows evidence of intense and persistent pollution from the surface to theupper troposphere in different regions highly affected by biomass burningpollution and anthropogenic activities: China (Beijing, Shenyang, Quingdao), North America (Vancouver), South America (Rio de Janeiro, Sao Paolo), Africa (Windhoek). Contributions of surfaceemissions injected at different altitude levels and transported downwind areinvestigated through a modelling approach using the Lagrangian FLEXPART model coupledwith emission inventories (MACCITY, EDGAR for anthropogenic emissions, GFAS,GFED for biomass burning).

Afirst focus is realized over Africa where more than 2,000 daily flights havebeen performed since 2006, to investigate the fate of carbon monoxide emittedby regional sources (Africa) from the one emitted by continental and globalsources (South America and Asia).

Anotherfocus is made on transpacific transport of Asian emissions (biomass burning andindustrial emissions) which affect the west coast of North-America (Vancouver). This transport is evidenced byregular CO measurements over the North-Pacific, where CO emission plumes aresampled over North-East China, athigh altitude over the Pacific and over the American west coast.

Finallywe show the perspective of the IAGOS program in tracking and investigatingpollution through new measurements of key species such as CO2, aerosols andNOx, which will help better understanding the photochemical evolution ofpolluted air masses and better tracking sources of emissions.

P4.133 - EVALUATING THE IMPACT OF VEHICULAR EMISSION FACTORS CHANGE ON TROPOSPHERIC OZONE FORMATION IN THE METROPOLITAN AREA OF SÃO PAULO (MASP)

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This study aims to develop and evaluate a new emissions inventory withvehicular flow road-per-roadpor Metropolitan Region of São Paulo andits evaluation and atmospheric simulation with WRF-Chem. The methodconsisted in a generalized linear model of vehicle counts asdependent variable and type of road and hour as independentvariables. Poisson and negative binomial distributions wereconsidered for vehicucle counts distributions. The results show thatmerely the type of road gives significant estimates for every type ofvehicule for each hour. Further evaluation should be addressed inorder to incorporate other variables to the model, like congestion.

Introduction: The relationship between emissions inventories, meteorology andair quality has been widely studied (Andrade et al,2012). In order to obtain model of traffic counts, Zhong etal (2004) used an ARIMA . Zhao et al, (2004) used a regression modelto estimate annual average daily traffic. Considering this we developa traffic model relating type of road with Poisson distribution forvehicle counts (Zeileis et al, 2008). Later we used information of ofNational Department of Transit and Local Environmental Agency toobtain vehicular technology; and daily profile of traffic flowprovided by Maplink. For evaluationd WRF-Chem simulations wereperformed. Methodology: It was used generalized linear modelswith Poisson distribution for the traffic count with independentvariables of type of road and hour of the day: log (veh)=ß 0 +ß1 *TR+e: veh is traffic count, TR type of road (primary,secondary, tertiary, trunk and motorway). The traffic counts wereprovided Companhia de Engenharia de Tráfego for morning and eveningpeaks and contains cars, urban buses, trucks, motorcycles. Type ofroad was identified by Open Street Data. There are 206 traffic countsin São Paulo for the following hours: 08:00-09:00. Results:The frota estimated was emissions estimated were 6.482.518 (veh)emitting 1.468.959 (t CO/y), 558.889 (t NOx/y) and 328.884 (t COV/y),Conclusions The type of road is able for predicting the numberof vehícules. Nevertheless, the model would improve with congestion,land use and lanes per road. The east side of São Paulo downtown hashigher emissions.

P4.134 - PM2.5 MASS AND CHEMICAL CONCENTRATIONS OF CACHOEIRA PAULISTA AND SÃO JOSÉ DOS CAMPOS IN VALE DO PARAÍBA: EFFECTS OF RAINFALL AND AIR MASS TRAJECTORIES

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The PM2.5 is a particulate matter that has aerodynamic diameter less or equal to 2.5 μm, reaching the deep cardiorespiratory system and the bloodstream. The WHO (World Health Organization) establishedthe standard guidelines for this pollutant of 10 $\mu g/m^3$ as annual average and 25$\mu g/m^3$ as daily average. In Brazil, there are no standards for PM2.5,but CETESB (Environmental Agency of São Paulo State) monitors it in some airquality stations in different regions of the São Paulo State, except for Valedo Paraiba. This is an important region because of its intense traffic of heavy-dutyvehicles running with diesel as fuel, and its localization surrounded by fourfederal railways between São Paulo and Rio de Janeiro megacities. The objectivewas to analyze the PM2.5 mass and chemical concentrations for the twocities in Vale do Paraíba: Cachoeira Paulista and São José dos Campos. The presentcase corresponds to two weekdays in January (Summer) and August (Winter) of 2011,being both from day 15 to day 19. The effects of rainfall and air masstransport were analyzed for PM2.5 mass and chemical composition. Themodel HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory Model)were applied for the backward trajectories analysis. During the January week,52.6 mm rainfall was registered and in the August week no rain was observed,characterizing the Summer for the former and the Winter for the latter. The PM2.5average mass concentrations were similar for both cities, but higher in the Winterthan in the Summer. These values were 9.2 $\mu g/m^3$ and 23.9 $\mu g/m^3$ in CachoeiraPaulista and 10.9 $\mu g/m^3$ and 22.0 $\mu g/m^3$ in São José dos Campos for January andAugust, respectively. The backward trajectories showed a predominance of thenorthwest component for the air mass transportation for both cities. It isworth mentioning that in these periods the air mass transport was not observedfrom São Paulo and/or Rio de Janeiro. The elements and ions concentrationspresented similar behavior to those described above.

P4.135 - SOURCE APPORTIONMENT OF ORGANIC SUBMICRON AEROSOLS DURING WINTERTIME OVER THE ATHENS METROPOLITAN AREA. WOOD COMBUSTION CONTRIBUTION

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To assess the smog problem emerging through the lastfew years alongside the economic crisis outbreak, in the Athens metropolitanarea, a two month field measurement campaign was held, during winter 2013 –2014. Several instruments were deployed at the National Observatory of Athensfacilities in the center of the city. Measurements of submicron aerosol chemicalcomposition were acquired using the Aerosol Chemical Speciation Monitor (ACSM).Black Carbon was also monitored using a seven wavelength Aethalometer. AParticle Into Liquid Sampler (PILS) coupled with Ion Chromatography, was usedto determine tracers of wood combustion, mainly non sea salt potassium. Theorganic aerosol fraction acquired from the ACSM was subsequently parameterizedby Positive Matrix Factorization using the SoFi Toolkit based on the ME-2engine and adopting the source apportionment strategy. Organic aerosols weredominant in the submicron range with a mean contribution of 70% throughout themeasurement period. Five factors were identified after several PMF runs. Threeof them can be related to Primary Organic Aerosols (POA). These include aHydrocarbon–like Organic Aerosol (HOA) factor with a relative contribution of16%, presenting a diurnal cycle coinciding with traffic peak hours, a CookingOrganic Aerosol (COA) factor contributing a 9% to the OA load, peeking duringmeal hours and a Biomass Burning Organic Aerosol (BBOA) factorwith maximum values in the late evening and 15% of relative contribution. The two remaining factors exhibit signs of atmosphericprocessing (relatively strong $m/z = 44$ signal) and consist of an OxygenatedOrganic Aerosol (OOA) factor, with a diurnal pattern probably mostly related toPBL dynamics, which contributes 28% of the OA load and a dominant factor, relatedto biomass burning events (OOA-BB), contributing to the remaining 32%. The BBOAand OOA-BB factors significantly correlate to combustion tracers such as thenss - K?, Levoglucosan andwood burning BC (BCwb). Chloride species measured by the ACSM was also found toexhibit significant correlation with these two factors probably indicating combustionof industrially processed materials for heating purposes.

P4.136 - EXCEEDANCES OF PARTICULATE MATTER CONCENTRATIONS IN CYPRUS. REGIONAL OR LOCAL ORIGIN?

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Recent reports on the ambient particulate matter, PM, levels in Cyprus highlighted the occurrence of a significant number of PM exceedances above the limits set by EU legislation and pointed out the need for abatement strategies. The main objective of this study was therefore, a) to quantify the above exceedances and their temporal variability and b) to identify and understand their origin by accessing the contribution of the natural and anthropogenic PM sources influencing the ambient air in Cyprus and the Eastern Mediterranean Area. To this end, we present an extended time-series of sixteen years of particulate matter (PM10) observations conducted at the background Agia Marina monitoring station in Cyprus (EMEP, 532m a.s.l.). The mean PM10 levels at the Agia Marina-EMEP station (29.6±10.1 μg m-3: 1997-2012) are comparable to the ones reported for other East Mediterranean sites suggesting a common regional influence. Spatial particulate matter observations at all major urbancenters in Cyprus showed that on an annual basis almost 40% of the days in the city centers are characterized by elevated PM10 levels (>50μg m-3). However, by taking into account the regional PM levels of Agia Marina, the respective number of the computed exceedances originating exclusively from local emissions becomes significantly lower (21 days per year on average). Concurrent analysis of PM2.5, organic and elemental carbon mass concentrations at urban, suburban and rural monitoring stations revealed that a) on average, half of the measured PM10 concentration emanated from coarse particles mainly of natural origin (e.g. Sahara dust and/or soil re-suspension) and b) the OC/EC ratio at the natural background site of Agia Marina is equal to 4.84 pointing to secondary organic aerosol (SOA) formation, whereas in the urban and suburban sites, the OC/EC ratio is lower ranging from 1.46 to 1.84, denoting significant influence from fossil fuel primary emissions in the studied areas. All the above show that an important fraction of the reported exceedances can be associated with transported air masses affected by anthropogenic (e.g. Balkans, Central Europe, Turkey) and natural (e.g. mineral African dust) emissions that impact on the regional background of pollution in the Eastern Mediterranean.

P4.137 - TEMPORAL AND SPATIAL VARIABILITY OF TROPOSPHERIC OZONE IN CYPRUS AND THE EASTERN MEDITERRANEAN

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This study focuses on the temporal and spatial variability of surface ozone levels in the Eastern Mediterranean area, a region affected by transported air masses of various origins with variable chemical composition and by high insolation. Valuable new information on the origin and temporal variability of ozone emanated from the statistical analysis of a long-term record (1997-2012) of continuous ozone concentrations at the rural Agia Marina (EMEP, 532m a.s.l.) station in Cyprus. The observations revealed the presence of a prominent seasonality with maxima and minima observed during summer (54 ± 5ppbv) and winter (39 ± 3ppbv), respectively. The deseasonalized annual data suggest a non-significant upward trend over the 16 years of 0.11±0.12 ppbvy-1. To assess the ozone spatial variability simultaneous measurements have been performed in 2011-2012 at Inia and Cavo Greco, two remote marine sites located to the west and the east of the island respectively. Our results show that the ambient ozone levels over Cyprus are mostly influenced by the regional transported background ozone while the local precursor emissions play a minor role (less than 6%). On an annual basis a net ozone reduction of 1.5 and 1.0 ppbv occurs when the air masses originate from northerly and westerly directions, respectively, while this is 2.4 ppbv during southerly wind. This suggests continuous net ozone loss controlled by surface deposition and photochemical destruction, and highlights the importance of long-range transport in controlling ozone levels in Cyprus.

P4.138 - OXIDATION OF ORGANIC AEROSOL OVER THE PO VALLEY BASIN OBSERVED FROM MT. CIMONE HIGH ALTITUDE STATION

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High resolution time of flightaerosol mass spectrometer (HR-ToF-AMS) measurements have been performed, forthe first time, at Mt. Cimone GAW station (44°12' N, 10°42' E, 2165 m asl)between June and July 2012, under the framework of the EU project PEGASOS and theEmilia-Romagna Region project SUPERSITO. The main aerosol components (organics,sulphate, ammonium and nitrate) show a clear concentration trend, at thesampling site, as a result of the planetary boundary layer (PBL) dailyevolution. The highest concentrations are observed during the day, when thesite is within the PBL and is affected by the aerosol sources located withinthe Po Valley basin. Conversely, the concentrations reach their minimum atnight, when the top of Mt. Cimone is above the shallow nocturnal layer, in theresidual layer (LR), disconnected to the underlying aerosol sources. Elementalanalysis performed with high resolution mass spectra (Aiken et al., 2007),revealed decreasing average H/C and increasing O/C ratio from PBL to RL samples.Consequently, the average OM/OC ratio passes from 1.83±0.05 in PBL, to1.94±0.08 in RL samples. These results evidence the progressive oxidation of OAover the Po Valley basin, from few hours after their emission/formation to oneor more days of atmospheric processing. On a Van Krevelen space, the dataproduce a slope of ~ –1, suggesting that the observed regional scale oxidationprocesses occur mainly through the addition of carboxylic functional groups(Heald et al., 2010). This is further confirmed by the analysis of the HR massfragments, showing an enhanced contribution of fragments containing carbon,hydrogen and more than one oxygen atom, in RL samples with respect to PBL ones.Positive Matrix Factorization (PMF) was performed on the high resolutionorganic mass spectra collected through the whole campaign. Preliminary resultssupport the above findings on aerosol ageing.

Aiken et al. (2007), Anal. Chem.79, 8350-8358.

Heald et al. (2010), Geophys.Res. Lett. 37, L08803.

P4.139 - BLACK CARBON INDOOR POLLUTION AND HUMAN HEALTH IN THE HIMALAYAS

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High concentrations of particulatematter and other pollutants emitted from fossil fuel combustion, biomassburning and biofuel cooking activities have severe implications to human healthand to agriculture, ecosystem and earth's radiative balance. In particular, indeveloping countries, a major source of indoor air pollution is smoke from openfires and cook stoves emitting high amounts of pollutants, including carbonmonoxide. Among these indoor pollutants, black carbon (BC) particles areemitted at concentration about a factor of magnitude higher than the moderncook stoves. BC and other co-emitted species have a particularly large impacton public health because they make up a substantial part of both indoor andoutdoor pollution.

During November2013, an interdisciplinary field campaign took place in avillage of the Nepalese Himalayas, where people lives according to old traditionallifestyle. Eight different homes were monitored for about 24 hours continuouslyusing a portable indoor air-quality monitor for BC. In addition, a portable detectorwas used to perform measurements of CO emitted by wood stoves when the fire wasaglow and off.

Preliminary analyses showed thatconcentrations of BC higher than 10µg/m3, are observed duringthe morning and especially evening hours, when the braziers are burning wood ordung for cooking and heating. The CO concentrations during the burning of the brazieralways exceeded 10 ppm.

In connection with these measurements, 76 non-smokers (55 females, age 18-85) weresubjected to the lung function test. Bronchial obstruction was present in 7.9% ofthe subjects (26.9% of subjects > 50years). Early bronchial obstruction was present in 27.6% (55% of subjects >50 years). These results are higher than expected in non-smoking subjects. 71subjects (48 females) underwent also cardiovascular evaluation. The occurrence ofhypertension was 21%, diabetes 7%, hypercholesterolemia (LDL>130mg/dl) 44%,obesity 10%, low HDL 49%, hypertriglyceridemia 24%. The endothelial function ofthe brachial artery, a method to assess early risk of atherosclerosis, was reduced(maximum percentage increase in diameter after reactive hyperemia: 4.07 ± 2.34%). Chronic exposure to indoor pollution, as monitoredduring this study, definitely impairs cardiorespiratory health in mountaindwellers.

P4.140 - SOURCES, SEASONAL VARIABILITY AND OXIDATION STATE OF ORGANIC AEROSOL IN THE EASTERN MEDITERRANEAN

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Thesources, seasonal variability and oxidation state of organic aerosol werestudied at the remote background site of Finokalia, Crete (EasternMediterranean) for a period of 16 months (June 2012 to December 2013). Thestudy is based on measurements performed using an Aerosol Chemical SpeciationMonitor (ACSM) and the resulting organic components identified by PositiveMatrix Factorization (PMF) analysis of the organic mass spectra. Differentfactors and subsequently different sources are identified depending on theseason, each factor having varying contribution to the total organic aerosol(OA). Overall the O/C ratio of the total OA varies between 0.61 and 1.31, witha mean value of 1.06±0.13, which is within the observed values oflow-volatility oxygenated organic aerosol (OOA) and dicarboxylic acids. Thisratio can be a proxy for the oxidation state and its variability can reflectthe variations in OA age during the measurement period. Based on PMF analysis,throughout the study period the factor that exhibits the largest contributionis a highly oxygenated OA with pronounced relative intensity of m/z 18 and 44,which is furthermore supported by its elevated O/C (1.25±0.07). It exhibits aseasonal cycle with minimum average concentrations during winter (1.07±0.82 μg m-3) andmaximum during summer (2.13±1.07 μgm-3) and respective contribution of 52% and 58%. Long-rangetransport of biomass burning from Southeastern Europe and countries surroundingthe Black Sea influence the site during two periods (April-May andJuly-September). The fresh BBOA factor during these periods is estimated tocontribute on average 17.1±2.2% to the total OA. Finally, a distinct regionalsource of olive tree branches burning, which is a common agricultural wastemanagement practice in the Mediterranean area after the annual pruning of olivetrees, is also identified from November to February (not included in theaforementioned BBOA). This factor can contribute up to 48% of the identified OAduring wintertime and can be regarded as an important emission source duringthis season in the region.

SESSION 5: ATMOSPHERIC CHEMISTRY FUNDAMENTALS

P5.1 - WHAT CONTROLS THE TRANSITION FROM LOW TO HIGH SURFACE OZONE DURING WINTER IN THE NORTH – WEST INDO-GANGETIC PLAIN (IGP): METEOROLOGY, RADICAL CHEMISTRY OR EMISSIONS?

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Mechanistic studies aimed at understandingthe drivers of surface ozone in winter time in North India do not exist. Here,we investigate the NO-NO2-O3 photostationary state andradical chemistry at a regionally representative suburban site (30.667°N,76.729°E) in North – West Indo-Gangetic Plain (IGP) using in-situ measurements(1 minute time resolution) of ozone, its precursors NOx (NO + NO2),speciated volatile organic compounds (VOCs) and relevant photolysis ratesduring the winter season (January 1-15, 2013). The period from January 1-8 wasmarked by low average ozone levels of ~ 13 ppbv, whereas from January 9-15, theaverage ozone levels increased to ~ 42 ppbv. This provided a unique opportunityto examine changes in the drivers of surface ozone at the regional site. TheLeighton ratio and its variability in response to different precursor regimeswas used to derive total peroxy radical concentrations. During the high ozoneperiod, the calculated average peroxy radical concentration was 204 ± 140 pptvwith maximum concentration of 590 pptv which is remarkable for wintertimeconditions for most sites in the world. During this high ozone period the calculatedperoxy radical concentration correlated significantly with peroxy radicalproduction rate, derived using the in-situ OH reactivity. Generally, theoccurrence of higer hydroxyl (OH) radical concentrations were the major reasonfor higher ozone levels in winter causing the transition from lower to higher photochemicalregimes for ozone formation. However during intense fog episodes, the wetscavenging of ozone and peroxy radicals due to rapid reaction (in the timescaleof millisecond to second) with H2O and O2- presentin the droplets of fog, resulted in reduced ozone levels. During certain afternoonsit was also observed that high ambient ozone levels were characterized by highwind speeds so that during such periods, transported ozone was also asignificant factor for high surface ozone at the site.

P5.2 - AUTOPHOTOCATALYTIC PROPERTIES OF ORGANIC AEROSOLS: A NEW PATHWAY FOR SOA GROWTH IN THE TROPOSHERE?

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Humankind is facing a changing environmentpossibly due to anthropogenic stress on the atmosphere. In this context,aerosols play a key role by affecting the radiative climate forcing,hydrological cycle, and by their adverse effect on health (Donaldson, Li et al. 1998). The role of organic compounds inthese processes is however still poorly understood because of their massivechemical complexity and numerous transformations. This is particularly true forSecondary Organic Aerosol (SOA), which are produced in the atmosphere byorganic gases.

Traditionally, the driving forcesfor SOA growth is believed to be the partitioning onto aerosol seeds ofcondensable gases, either emitted primarily or resulting from the gas phaseoxidation of organic gases(Volkamer,Ziemann et al. 2009). However, even the most up-to-datemodels based on such mechanisms cannot account for the SOA mass observed in theatmosphere, suggesting the existence of other, yet unknown formation processes.The present study shows experimental evidence that particulate phase chemistryproduces photo-sensitizers that lead to photo-induced formation and growth ofsecondary organic aerosol in the near UV and the presence of volatile organiccompounds (VOC) such as terpenes(Monge, Rosenørn et al. 2012).

By means of an aerosol flow tube reactorequipped with Scanning Mobility Particle Sizer (SMPS) having Kr-85 sourceaerosol neutralizer, Differential Mobility Analyzer (DMA) and CondensationParticle Sizer (CPC), we identified that traces in the aerosol phase of glyoxal chemistry products, as isexplained in Gallway et al., and Yu et al.,(Galloway, Chhabra et al. 2009; Yu, Bayer et al. 2011), namely imidazole-2-carboxaldehyde (IC) arestrong photo-sensitizers when irradiated with near-UV. In the presence ofvolatile organic compounds such as terpenes (Aregahegnet al., submitted, 2013), this chemistry leads to a fast aerosol growth. Thisobservation will be presented.

Furthermore, the influence of pH, type andconcentration of VOCs, composition of seed particles, relative humidity andirradiation intensity on particle growth were studied.

On top of thepossible in situ production of photosensitizer, VOCs having unsaturated-tertiary carbon were observed to lead to SOA growth. Due to the presence ofexocyclic and endocyclic unsaturated tertiary carbon, limonene was observed tolead to an efficient SOA formation and growth. This novel photo-sensitizer, IC,contributed to more than 30% of SOA growth in 19min irradiation time in thepresence of terpenes in the system, depending linearly with the irradiationintensity. These results demonstrate that, upon ageing, organic aerosols canproduce photo-sensitizers which auto-photo-catalyse their SOA growth.

Donaldson,K., X. Y. Li, et al. (1998). Journal of Aerosol Science 29(5–6):553-560.

Galloway, M. M., P. S. Chhabra, et al. (2009). Atmos.Chem. Phys. 9: 3331-3345.

Monge, M. E., T. Rosenørn, et al. (2012). Proceedings of the National Academy of Sciences 109(18):6840-6844.

Volkamer, R., P. J. Ziemann, et al. (2009). Atmos.Chem. Phys. 9(6): 1907-1928.

Yu, G., A. R. Bayer, et al. (2011). Environmental Science & Technology 45(15): 6336-6342.

P5.3 - COMPREHENSIVE ANALYTICAL SYSTEM FOR MEASURING ISOPRENE-DERIVED NITRATES

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Globaland regional model studies show that the calculated impact of isoprene on O3is critically dependent on the model isoprene oxidation chemical scheme, inparticular the way the isoprene-derived nitrates are treated. There isconsiderable uncertainty over the yield and fate of isoprene nitrates, inparticular whether NOX tied up in the nitrates is later recycled oris lost from the atmosphere. Much of what is known about this chemistry isbased on theoretical calculations, with most observational constraints based onmeasurements of either groups of nitrates as totals, or degradation productsthat come from more than one reaction and precursor species.

To address these shortcomings we have been developing ananalytical system able to unambiguously identify, and quantify theconcentrations of, individual isoprene nitrates. Specifically this requires the chemicalsynthesis of individual isoprene nitrates. To date we have developed synthetic methods for a range of isometricallypure isoprene nitrates (such as primary nitrates from OH or NO3addition to isoprene and secondary nitrate products such as acetone nitrate). Wehave also been developing a dual-channel GC-MS analysis system and itsassociated calibration system. Analyses have been performed using two different column phases and in both EI and Negative Ionmodes.

P5.4 - AN INVESTIGATION OF THE OZONOLYSIS OF ISOPRENE UNDER ATMOSPHERIC CONDITIONS

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Biogenic volatile organic compounds (BVOCs) constitute the largestfraction of the total volatile organic compound (VOCs) present in theatmosphere. They originate from natural emissions and have a profound impact onthe atmospheric chemistry associated with ozone production and secondaryorganic aerosol (SOA) formations. In addition, they have an important influenceon the oxidizing capacity of the atmosphere, through their impact on the HOxradical budget. On the other hand, in the recent years, the importance of theindoor chemistry involving terpenes has become an important issue due to theformation of toxic pollutants such as formaldehyde. Although the atmosphericoxidation schemes of BVOCs have been investigated previously by numerousgroups, it is well accepted that the present models describing BVOCsatmospheric fate are still not well defined. Further studies to elucidate themissing reaction channels are hence needed.

In this study, we present a comprehensive investigation on theozonolysis of isoprene, the most abundant BVOCs emitted into the atmosphere,using the newly constructed large atmospheric simulation chamber, HELIOS. The HELIOS facility consists of a large outdoorsimulation chamber integrated into the ICARE-CNRS Laboratory in Orleans,-

France. It is constituted of a hemispherical FEP foil chamber (volume of » 100 m3) with a retractable cover tocontrol the exposure to sunlight. The chamber is equipped with a range ofin-situ and off-line analytical instrumentation (FTIR, PTRMS-TOF,GC-MS/FID/PID, ozone and NOx monitors, HCHO-Hantz's method, Lopap-HONO, SMPS,....)in addition to sensors for other parameters measurements (e.g. T, P. RH).

The investigation includes a kinetic and mechanisticstudy under different conditions. The rate coefficient for the reaction ofozone with isoprene has been re-visited in the presence and absence ofscavengers. A number of the ozonolysis products have been identified andquantified by different techniques. The results obtained will be presented andcompared to previous studies. Furthermore, the capacities of the HELIOSfacility for investigating the atmospheric processes under realistic conditionswill be exposed.

P5.5 - GLOBAL TROPOSPHERIC O3 BUDGET IN HADGEM2-ES – A RANKING OF SENSITIVITIES

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Ozone is one of the key trace species in the atmosphere. It has a prominent role in both air quality, as a major component of photochemical smog, and in climate, as an important greenhouse gas. Moreover, ozone is the main source of hydroxyl radicals in the troposphere which in turn define the lifetime of methane, another key greenhouse gas. As a consequence of this shared role ozone effectively entangles air quality and climate inextricably. The concentration of ozone in the troposphere depends on numerous processes including natural and anthropogenic emissions of precursors (predominantly NOx, CH4 and VOC), atmospheric transport, tropospheric photochemistry, and its sinks, foremost dry deposition at the surface. However, state-of-science Earth system models that can resolve many of the processes involved in the formation and destruction of ozone in a fully integrated manner have only become available very recently. While many of the processes have been explored individually with regard to ozone sensitivity not much is known about the role of feedbacks in the variability and sensitivities of the ozone budget. We explore the sensitivity of the ozone budget to perturbations in meteorology and physical processes and uncertainties in emissions and the chemical mechanism. These sensitivities are assessed with the state-of-science HadGEM2 Earth system model. HadGEM2, in its Earth system configuration, includes, amongst others, an extensive tropospheric chemistry component (UKCA-ExtTC), a comprehensive land-surface component (MOSES-TRIFFID) and an interactive bVOC emission model (iBVOC). We use this framework to assess and rank ozone budget sensitivities.

P5.6 - THE WORLD CALIBRATION CENTER - ULTRAVIOLET SECTION (WCC-UV)

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A GAW regional UV calibration center for the European region (WMO RA VI(Europe)) has been established at PMOD/WRC since January 1, 2008. Its mainfunction is to ensure that the data submitted to the GAW World UV data Centre(WOUDC) operated by the Meteorological Service of Canada in Toronto is of knownand adequate quality to meet the needs of the scientific community. By itsactivities, the European Ultraviolet

Calibration Center aims at improving thedata quality in the European GAW UV network and at harmonizing the results fromdifferent stations and monitoring programs in order to ensure representativeand consistent UV radiation data on a European scale. As of 1st January 2013, thePMOD/WRC has been recognized as a World Calibration Center (WCC) for UVradiation for the World Meteorological Organization, Global Atmosphere WatchProgramme (WCC-UV).

We present the Terms of Reference for the WCC-UV. These are first, to assistWMO Members operating WMO/GAW stations to link their UV radiation observationsto the WMO/GAW Reference Scale through comparisons of the station instrumentswith the standard instruments operated by PMOD/WRC. Second, to assist theWMO/GAW Scientific Advisory Group (SAG) on UV radiation in the development ofthe quality control procedures required to support the quality assurance of UVobservations and ensure the traceability of these measurements to the correspondingprimary standard. Third, to maintain a set of reference irradiance standardsand ensure their traceability to the SI units through purchase andintercomparison of transfer standards traceable to primary irradiance standardsheld at National Metrological Institutes (NMIs). Fourth, to maintain andoperate a transportable reference spectroradiometer for the routine qualityassurance and calibration of spectroradiometers measuring spectral solar UVirradiance through regular site visits. Fifth, to maintain and operateinstrumentation, to provide calibration facilities for UV radiation radiometers(spectral and broadband). And finally to provide traceability to the primaryspectral irradiance standards of NMIs, by calibrating spectral irradiancestandards of UV monitoring laboratories.

P5.7 - TEMPERATURE DEPENDENCE OF AEROSOL FORMATION BY OZONOLYSIS OF A- AND SS-PINENE OVER AN EXTENDED CONCENTRATION RANGE

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Secondary organic aerosols (SOA) from the oxidation of biogenic volatileorganic compounds (BVOC) like the monoterpene pinene are a large fraction ofthe tropospheric aerosol especially over tropical continental regions. Theinfluence of temperature and precursor concentrations on secondary organicaerosol (SOA) yields are still major uncertainties in tropospheric aerosolmodels. Monoterpene concentrations in and above tropical or boreal forestsreach values up to a few tenth of a ppb during daytime decreasing rapidly withaltitude in the boundary layer (Kesselmeier et al. 2000; Boy et al., 2004). Particle formation under these conditions is dominated by condensation ofsubstances with very low vapour pressures (Ehn et al., 2014). However, moststudies so far are limited to terpene concentrations of several ppb and higher.

Therefore we investigatedthe yield of SOA from the ozonolysis of a- and ß-pinene with an excess of ozone(220-930 ppb) in the 84 m3 aerosol chamber AIDA for initial terpeneconcentrations between 0.1 and 1 ppb. The temperatures investigated ranged from243 to 296 K with relative humidities between 25% and 41%. Based on measured particlesize distributions (2-820 nm), particle number concentrations, and trace gasevolution model calculations were done using the dynamic aerosol model COSIMA-SOA(Naumann, 2003; Saathoff et al., 2009) in combination with the master chemicalmechanism.

The overall SOA yields increasesignificantly with decreasing temperature. However, compared to the yieldsextrapolated from experiments done with higher terpene concentrations the SOAyields at ambient concentrations are surprisingly high. They reach values of upto 20% at 243 K for organic aerosol mass concentrations of about 0.5 μg m-3even without additional seed aerosol.

Boy et al., (2004) Atmos.Chem. Phys. 4, 657–678.

Ehn et al., (2014) Nature 506, 476-479.

Kesselmeier et al., (2000) Atmos. Environ. 34, 4063-4072

Naumann (2003) J. Aerosol Sci. 34 (10), 1371-1397.

Saathoff et al., (2009) Atmos. Chem. Phys. 9(5), 1551-1577.

P5.8 - LONG-TERM MONITORING OF NOY AND T.NO3(= HNO3(G) + NO3-(P)), AND THEIR TEMPORAL TREND ANALYSES AT CAPE HEDO, OKINAWA JAPAN TO EVALUATE THE TRANS-BOUNDARY POLLUTION FROM THE ASIAN CONTINENT

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Recent economic growth in East Asian countries, especially in China, has been bringing impacts on the global environment. Much attention has been paid on the increases in emissions of atmospheric pollutants, such as nitrogen oxides (NOx), and the monitoring of surface NO2 from satellites and chemical-transport modeling studies have clearly demonstrated the distribution of NO2hot spots in the Asian continent. However, limited efforts have been reported on the ground-based long-term monitoring of nitrogen oxides species focusing on the trans-boundary pollution by the increasing emission of NOx.

We started continuous monitoring of NOy and T.NO3 at Cape Hedo, Okinawa from November 2005. The site, NIES Cape Hedo Aerosol and Atmospheric Monitoring Station (CHAARMS), is located in the northernmost part of Okinawa main island, 26.86° N and 128.25° E, and is in the East China Sea. The site is a representative remote place of Japan. NOyand T.NO3 have been measured by a scrubber-difference/chemiluminescent NOxmonitor modified from the commercially-available instrument. O3and CO are also continuously monitored at CHAAMS by commercially available monitors.

Temporal trend analyses by a simple linear regression for daily-averaged concentrations of NOy and T.NO3 against time during the period from Nov. 2005 to Aug. 2013. The trends analyzed for the whole data of the period show very small positive value (+ 0.008 ppbv/yr), and a negative value (-0.056 ppbv/yr) for NOy and T.NO3, respectively. Student's t-tests with 95% significance level indicate that the small positive trend for NOy is statistically insignificant and significant for T.NO3. This implies the NOy and T.NO3concentrations at the site during the period are staying substantially constant and decreasing, respectively, although many studies have reported the robust evidence of the increases in NO2 concentration in the Asian continent. On the other hand, the same trend-analyses of NOy for each individual calendar month give positive trends for the months in autumn and winter, with statistical significance for November, December and January, indicating NOy has been being increasing in these seasons. This increasing trend could be due to the trans-boundary pollution from the Asian continent, judging from the prevailing seasonal winds.

P5.9 - CHEMICAL STABILITY OF LEVOGLUCOSAN IN LABORATORY AND AMBIENT AEROSOL STUDIES: AN ISOTOPIC PERSPECTIVE

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Levoglucosan, used in receptor models as the specific tracer of particulate matter emissions from biomass burning, has long been considered being stable in the atmosphere. More recent ambient studies signalized significant atmospheric chemical degradation of levoglucosan, being supported by few following laboratory investigations. These showed that the levoglucosan concentration strongly decays in atmospherically relevant particles exposed to OH radicals. Isotopic analyses, complementarily to concentration measurements of molecular tracers, can provide additional evidence for chemical processing, since this causes changes in the relative abundance of heavy to light isotopes due to the kinetic isotope effect (KIE). Moreover, due to the potential to fingerprint emissions, as well as chemical and physical processes in the atmosphere, stable isotopes are considered as a promising tool to improve our understanding of sources and atmospheric fate of organic aerosol.

In this study, the chemical stability of levoglucosan was studied by exploring the isotopic fractionation of the reactant during the oxidation by hydroxyl radicals, in aqueous solutions as well as by exposing atmospherically relevant particles to gas-phase OH. In both cases, the samples, experiencing different extent of processing, were isotopically analyzed by using Thermal Desorption /Liquid Extraction - Two Dimensional Gas Chromatography - Isotope Ratio Mass Spectrometry (TD/LE-2DGC-IRMS). From the dependence of levoglucosan d13C and concentration on the reaction extent, a KIE value was derived being within the range of predicted values for alkanes and alkenes with the same number of carbon atoms.

The obtained laboratory kinetic data on the isotope effects of the levoglucosan degradation were employed to interpret ambient observations. Therefore, compound specific isotopic measurements of levoglucosan were carried out for ambient aerosol sampled during biomass burning episodes at rural, suburban and urban sites in Guangdong province, China. Further, the origin and pathways of the probed air masses were determined, basing on back trajectories calculated with the Lagrangian particle dispersion model FLEXPART from ECMWF meteorological data. The results combining observed d13C for levoglucosan with back trajectory analyses will be discussed in relation to the potential of using compound specific d13C measurements for improved source apportionment and determining the photochemical age of organic molecular markers.

P5.10 - PRODUCTION OF LOW MOLECULAR WEIGHT DICARBOXYLIC ACIDS, ?-OXOACIDS, PYRUVIC ACID, GLYOXAL AND METHYLGLYOXAL VIA OZONE OXIDATION OF ISOPRENE

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Low molecular weight dicarboxylic acidssuch as oxalic acid (C2) are most abundant organic compound class inthe atmospheric aerosols. Due to their water-soluble properties, diacids canenhance the hygroscopicity of atmospheric particles. Diacids can be primary emitted from combustion sources such as fossil fuel combustion and biomass burning and secondarily produced by photochemical oxidations of biogenic and anthropogenic hydrocarbons. However, their sources and formation processes are still not well understood. Isoprene is the most abundant BVOC emitted from terrestrial plants and can serve as important precursors of diacids. We conducted a laboratory oxidation of isoprene (2.0 ppm) with ozone (4.3 ppm) ina Teflon bag for 10, 30, 60, 120, 240, and 480 min. The formed particles were collected with quartz fiber filters and analyzed for diacids, oxoacids and a-dicarbonyls employing water extraction and butyl ester derivatization and using GC and GC/MS techniques to better understand the production of dicarboxylic acids and related compounds from isoprene. Here, we report the production of homologous diacids and related compounds from isoprene.

We detected homologous series of straight-chain diacids (C2-C6), branched-chain diacid (iC4), unsaturated diacids (maleic and methylmaleic acids) as well as w-oxocarboxylic acids (C2-C9), pyruvic acid, glyoxal and methylglyoxal. We found that oxalic acid (3000-9700 ngm-3) is the dominant diacids followed by succinic (C4) or malonic (C3) acid. Their concentrations increased with reaction time with maximum in 4 hours. Interestingly, C3/C4 ratios increased with time. The second most abundant species following oxalic acid was generally methylglyoxal (3600-9600 ngm-3), except for the 30 min. sample where methylglyoxal was more abundant than oxalic acid. We also found that glyoxylic acid (wC2) is abundantly produced from isoprene with concentration range of 1600-3800 ngm-3, followed by wC3 and wC4. We will present the variations of concentrations and molecular distributions of diacids and related compounds with reaction time and discuss the importance of isoprene as a source of oxalic, malonic, succinic and glyoxylic acid, and methylglyoxal in ambient aerosols. Although the laboratory concentrations are 1-2 orders magnitude higher than the ambient values, this study demonstrates that isoprene is an important source of diacids in atmospheric particles.

P5.11 - ASSESSMENT OF PHOTOCHEMICAL AIR QUALITY SIMULATION OVER CUBA WITH WRF-CHIMERE

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This research presents the results of the photochemical air quality simulation using WRF-CHIMERE over Cuba in two case studies. Anthropogenic emissions data fromthe EDGAR 4.1 database were used, making the necessary adjustments in the CHIMERE emission pre-processor. The WRF simulated one year (2009) and the results were validated against observed meteorological data. The modeling periods in CHIMERE were ten days in January and ten in August.

The reported emissions in EDGAR 4.1 and 4.2 were compared to the Greenhouse Gases National Inventory. This evaluation has demonstrated a very good agreement for CO2 (total and by sectors) and a fair agreement for CH4, NOX, SO2 and NMVOC. The analysis of the EDGAR data spatial distribution also shows good consistency. Although EDGAR 4.2 was not used in the air quality modeling in this research, it was analyzed for future modeling tasks. The differences in SO2 emissions are solved normalizing EDGAR 4.2 emissions to Cuban National Inventory by sectors.

Biogenic emissions are estimated using Model of Emissions of Gases and Aerosols fromNature (MEGAN) for a and b pinene, nitrogen monoxide, limonene, ocimene and isoprene. The emissions are estimated according to meteorological conditions of the modeling period and land-uses information.

The CHIMERE results are coherent with the theory and with the available measurement values reported for the country. The O3 average concentrations are highest in January, due to the transboundary transport from North America, and lowest in August, in spite of the higher solar radiation in this period. The absolute maximum is west of Havana. There are significant peaks to the west of Santiago and Cienfuegos, which shows the high contribution of domestic emissions into the O3 concentrations. The hourly maximum concentration was 116 microgram/Nm3, greater than 80, ceiling established in the Air Quality Cuban standard.

Although the results from this study have shown the capabilities of the methodology followed as an air quality diagnostic and forecasting tool for air quality in Cuba, further studies need to be carried out to solve the uncertainties involved in the implementation process.

P5.12 - CHEMICAL CHARACTERIZATION OF SÃO JOSÉ DOS CAMPOS AND CACHOEIRA PAULISTA (SAO PAULO-BRAZIL) ATMOSPHERE USING DENUDERES SYSTEM: PRELIMINARY RESULTS.

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The content of nitrogen reactiveforms in excess in the atmosphere negatively influences the environment, humanhealth and climate change. Here it is presented preliminary results of a study conductedto characterize chemically the partition between the particulate and gaseousphases examining some inorganic chemical species. This study was conducted intwo different regions: urban (São José dos Campos/SP-Br: SJC) and rural(Cachoeira Paulista/SP-Br: CP) covering a period from August until September2013. The gaseous phase chemicals studied are NH3, HNO3,NOx, SO2and HCl and particulate phase chemicals are NH4+,NO3-, SO42- and Cl- intheir ionic soluble forms. These results shown the feasibility of theuse of denuderes and filters1 as substrate for sampling. Inaddition, a comparison with results obtained for airborne particulate matter forthe same chemicals (PM2.5 and PM2.5-10) collected in neutralsubstrate is made. The results for SJC indicate an effective contribution fromindustrial sources as well as from fossil fuel combustion while in CP thecharacteristics are of a region with livestock sources. It is also observedthat the active substrates are more efficient in collecting PM than that of theneutral ones and that the latter may underestimate the contribution of gaseousphase for the formation of the particulate matter (PM).

Table 1 – Concentration mean values ofthe chemicals (μg.m-3) in the different fractions and phases ofatmospheric aerosol (g: gas phase, p: particulate phase).

SJCCP
μg.m-3μg.m-3
g*pPM2.5PM2.5-10gpPM2.5PM2.5-10
Cl-0,4360,6330,0740,1730,0800,1060,0290,139
NO3-2,191,580,2840,5550,3530,3760,1360,396
SO42-11,42,680,6150,2610,5920,2540,4440,149
NH4+6,302,170,2960,2621,120,4090,2650,186
1Sutton et al, Water, Air and Soil Pollution.Focus, 2001, 1(5/6), 1456.

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P5.13 - ANALYSIS OF THE OH BUDGET WITH A SERIES OF TERPENOIDS IN THE ATMOSPHERE SIMULATION CHAMBER SAPHIR

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The hydroxyl radical (OH) is the main oxidation agent in the atmosphere during daytime. Recent field campaigns studying the radical chemistry in forests showed large differences between measured and modeled OH concentrations at low NOx concentration and when the OH reactivity was dominated by large concentrations of volatile organic compounds (VOC). These findings were only partially explained by the introduction of new efficient hydroxyl radical regeneration pathways in the isoprene oxidation mechanism. The question arises if other reactive VOCs with high global emission rates are also capable ofadditional OH recycling processes. In addition to isoprene, monoterpenes and 2-methyl-3-buten-2-ol (MBO) are the VOCs with the highest global emission rates. Due to their high reactivity towards OH they can dominate the radical chemistry in forested areas under certain conditions.

The photochemical degradation of a-pinene, ß-pinene, limonene, myrcene and MBO was investigated in the Jülich atmosphere simulation chamber SAPHIR in a dedicated series of experiments in 2012 and 2013. The chamber was equipped with instrumentation to measure radical concentrations (OH, HO2, RO2),the total OH reactivity, concentrations of all important OH precursors (O3,HONO, HCHO), of the parent VOC, its main oxidation products and photolysis frequencies to investigate the radical budget. All experiments were carried out under low NOx conditions (< 2ppb) and atmospheric terpenoid concentrations (<5ppb) with and without addition of ozone into the SAPHIR chamber.

For the investigation of the OH budget all measured OH production terms were compared to the measured OH destruction. Within the limits of accuracy of the instruments the OH budget was balanced in all cases. Consequently unaccounted OH recycling or primary OH production processes did not play a role for conditions of these experiments.

Numerical simulations of the conducted experiments using the Master Chemical Mechanismv3.2 showed an underestimation of the OH production in the a-pinene, ß-pinene and limonene experiments. At the same time the measured OH reactivity was overestimated by the numerical simulation. First sensitivity studies showed that these discrepancies are most likely related to a missing source of HO2in the model.

P5.14 - FORMALDEHYDE MEASUREMENTS AND ANALYSIS OF OXIDATION CHEMISTRY OVER FORESTED FINLAND

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Formaldehyde (HCHO) is an important tracer for oxidative processes in the atmosphere such as oxidation of volatile organic compounds (VOCs) and production of HO2 radicals (by photolysis or reaction with OH). Products of VOC oxidation and radical cycling, such as aerosols and tropospheric ozone, have direct impacts on human health. During the Pan-European Gas-AeroSOls Climate Interaction Study (PEGASOS), HCHO measurements were obtained together with OH reactivity, OH, HO2, CO, O3, NOx, HONO, VOCs, and aerosol particle size distribution. HCHO concentration was measured by the Madison FIber Laser-Induced Fluorescence (FILIF) instrument, optimized for flight campaigns to accommodate size and power requirements. Here we present data collected in rural areas near Jämijärvi, Finland in Spring 2013. Finland provides a pristine environment, allowing investigation of primarily biogenic emission and cycles. Measurements were carried out aboard a Zeppelin, which flew vertical profiles ranging in altitude from ~200 – 1000 meters. In this way, we studied the height-dependent evolution of the lower atmosphere, in which most VOC oxidation chemistry occurs. Flights were carried out with starting times ranging from sunrise to post-sunset. We present overall trends seen during the campaign of HCHO and related species within the context of VOC oxidation and secondary pollutant production.

P5.15 - GLOBAL DISTRIBUTION AND TRENDS OF TROPOSPHERIC OZONE: AN OBSERVATION-BASED REVIEW

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A comprehensive understanding of global surface ozone trends has eluded the scientific community due to limited long-term in situ observations and relatively few ozone monitors in regionally representative rural or oceanic regions. Furthermore, satellite records of lower tropospheric ozone mixing ratios are presently too short to yield robust results. However, in recent years several studies have provided updates to ozone trends at long-established sites, or reported trends at many newer sites that now have lengthy records sufficient for trend analysis. To pull all these new findings together into a single reference, many colleagues and I have produced a review article on the global distribution and trends of tropospheric ozone [Cooper et al.,2014]. Relying upon this synthesis I will review all of the current ozone trend analyses in the peer-reviewed literature, focusing on rural rather than urban monitoring sites to facilitate understanding of ozone changes across broad regions. Trends at rural sites are also more easily compared to global chemistry-climate models. The earliest reliable ozone records began in the 1950s and 1970s with more and more sites becoming available in the 1980s and 1990s. The ozone rate of change has varied in magnitude and even sign over the decades with the strongest changes occurring in East Asia, eastern North America and Western Europe where changes in domestic ozone precursor emissions have been greatest. Ozone trends since the 1990s will be compared to global images of satellite-detected tropospheric column NO2 to identify regions where ozone trends are consistent, or inconsistent with observed ozone precursor changes and our general understanding of tropospheric chemistry. In addition I will present anew global analysis of 9-years of tropospheric column ozone as detected by the polar orbiting OMI and MLS instruments on the NASA AURA satellite, contrasting interannual ozone variability in the northern and southern hemispheres. The presentation will conclude with an overview of a new interdisciplinary and international effort to produce the first Tropospheric Ozone Assessment Report (TOAR).

P5.16 - THE CHARACTERIZATION OF ORGANIC AEROSOL SOURCE FOR HUMAN HEALTH IMPACT IN THE BRAZILIAN AMAZON

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The Amazon spans for more than half of the Brazilian territory and this region is the largest and most species-rich biome of the planet. However, human activities, such as agricultural expansion and thermoelectric power plants from diesel generators have become important agents of disturbance in the Amazon basin. The study of the air quality in this region is interesting from an environmental point of view, due to the negative impact that anthropogenic activities can have on human health. The Polycyclic Aromatic Hydrocarbons (PAHs) are known as persistent organic pollutants (POPS) and they are mainly formed by incomplete combustion process of organic materials such as biomass combustion, vehicular emissions, for example. Much focus is given to PAHs due to their carcinogenic, mutagenic and teratogenic characteristics. Thus, appropriate source identification is fundamental as guidance of public health policies and providing foundations for health intervention. The aim this work is to evaluate the origin of PAHs, levoglucosan and derivatives associated contribution of Organic Carbon (OC) and Elemental Carbon (EC) using a Principal Component Analysis (PCA) near Porto Velho, Rondônia State, southwest of Brazilian Amazon region. The results show a three-factor solution was resolved by PCA analysis. The first factor clearly showed that the source apportionment of OC (76%), EC (72%), levoglucosan (100%), mannosan (100%) and retene (100%) were dominated by biomass burning. The second factor was characterized by more than 65% of each of dibenz[a,h]anthracene, indene[1,2,3-c,d]pyrene and benzo[g,h,i]pyrene. Also, about 20% of OC and EC were associated with this factor. Therefore, this factor was considered as diesel emissions, that are higher during the dry season because there is a great demand for energy supply. This is also a critical period for the human health implications. The third factor depicts an important contribution of several PAHs without a single source class and therefore was considered as mixed sources factor. This work enhances the knowledge of aerosol sources on an Amazon region highly impacted by anthropogenic activities with significant contribution on climate and potential risks to human health, especially for the most vulnerable groups.

P5.17 - CAPRAM MECHANISM DEVELOPMENT BY MEANS OF MECHANISM SELF-GENERATION WITH GECKO-A: EVALUATION AND MODEL RESULTS

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The ubiquitous abundance of organic compounds in natural and anthropogenically influenced eco-systems as well as their influence on air quality, climate, and human health has put these compounds into the focus of environmental research. The current study aimed to investigate the multiphase composition and chemistry of organic compounds in the troposphere and examines feedbacks on SOA formation and particle acidification.The aqueous phase can play an important role in the oxidation process of organic compounds. Therefore, in the present study, the currently most comprehensive aqueous phase mechanism CAPRAM 3.0n has been extended by means of automated mechanism self-construction. To do so, the gas phase mechanism generator GECKO-A has been advanced to treat aqueous processes. A protocol has been designed for automated mechanism construction based on reviewed experimental data and evaluated prediction methods. The generator is able to describe the oxidation of aliphatic organic compounds by OH and NO3. For the mechanism construction, mainly structure-activity relationships are used. They are completed by Evans-Polanyi-type correlations, which have been further improved for the purpose of automated mechanism self-construction of larger organic compounds.Major improvements in the extended CAPRAM versions are the introduction of branching ratios and a more complete description of the C3 and C4 chemistry. The currently most comprehensive version, CAPRAM 4.0 alpha, includes over 4000 aqueous phase compounds and more than 7000 reactions.Special mechanisms have been designed, which were tested against chamber experiments at the aerosol chamber LEAK. Two experiments have been performed. In the first, hexane was oxidized by OH radicals under dark conditions and in the second, mesitylene oxidation by OH was realized by ozone photolysis. Concentration-time profiles and chemical turnovers have been thoroughly analysed and compared to the chamber results to evaluate the quality of the generated mechanisms.The extended CAPRAM mechanisms have been applied in box model studies with a non-permanent cloud scenario. Besides the analysis of the concentration-time profiles of important single organic compounds, detailed investigations have been performed on the particulate organic matter. The analyses included a distinction of the particulate organic content by compound class and by carbon number of the constituents.

P5.18 - DEVELOPMENT OF A NEW COMPREHENSIVE MECHANISM FOCUSED ON MARINE ENVIRONMENTS

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Thetropospheric multiphase chemistry of halogen compounds plays a key role inmarine environments. Moreover, halogen compounds have an impact on thetropospheric oxidation capacity and climate. More than two thirds of theearth's surface are covered with oceans, hence effects are of globalimportance. Various conditions are found in marine environments ranging frompristine regions to polluted regimes in continental outflows. Moreover, thereare important sources for halogen compounds over land, such as volcanoes, saltlakes, and emissions from industrial processes.To assess theimpact of halogen chemistry with numerical models under these distinctconditions, a multiphase mechanism has been developed in the last decades andapplied successfully in numerous box and 1D model studies. This contributed toresolve important chemical cycles affecting the composition and chemistry ofthe troposphere. However, several discrepancies remain such as overpredictedBrCl concentration deriving most likely from a too efficient activation ofparticulate bromide. To resolve these discrepancies, a major revision of thechemical mechanism has been performed including an update of the kinetic data andthe addition of new reaction cycles.Model studieswith the 1D column model MISTRA, for various scenarios with different chemicaland meteorological conditions, have beenperformed to assess contributions from the new reaction cycles and to evaluate themechanism by comparisons with field measurements from the Cape VerdeAtmospheric Observatory.Results fromthis very comprehensive new MISTRA version will serve as a reference for a subsequent mechanism reduction. Themechanism reduction is performed in two steps. First, a more condensed versionof MISTRA will be produced to be applied in further column model studies. Second,parameterisations will be derived from the comprehensive version for globalmodel studies. Both reduced versions aim to accurately predict theconcentration-time profiles of the key compounds O3, Cl, and BrO,but also try to minimise the errors in the concentrations of all othercompounds.

P5.19 - INTERHEMISPHERIC GRADIENT OF HYDROXYL (OH) IN THE TROPOSPHERE

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Observations and an atmospheric transport model of methyl chloroform (CH3CCl3) meridional gradients predict a Northern to Southern Hemisphere (NH/SH) OH ratio of slightly less than 1, whereas commonly used atmospheric chemistry models predict ratios significantly greater than 1. We have constrained the global total emissions and trends using simulated CH3CCl3 concentration decay rate, and the balance between global total emissions and annual mean OH concentration by peak-to-trough amplitude of annual cycle of NH-SH CH3CCl3 concentration gradient.

P5.20 - SAMPLERS OF PARTICULATE MATTER OF SANTIAGO, CHILE. COMPARATIVE ANALYSIS AND CONTRIBUTION TO AIR QUALITY POLICY.

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Air pollution in Santiago, Chilehas been an issue of public importancefor decades, due toits adverse effects on the healthof the population and theenvironment. Particulate matter (PM),and tropospheric ozone in certain areas ofthe city are the most important pollutants.

Sampling of PM was performed at the North Campus ofthe University of Chile; the site is located approximately 100m from a monitoringstation of air quality belonging to theMinistry of the Environment usingTEOM equipment (sinca.mma.gob.cl). In this work asampler SFU type Gent, and a Partisol 2000 were simultaneously used. SFU sampler collectsfractioned PM10-2 and PM2using filters of 47 mm diameter of polycarbonate (pore size 8μ) and Teflon (pore size 2μ). Partisol2000 sampler collectsPM2.5 with Teflonfilters (pore size of 2μ). The collection wasperformed from 4 to 25 November2013 (austral spring) in daytime (5:00to 21:00) and night (21:00 to5:00) local time, UTC-4. The filters were analyzed forgravimetric weight utilizing a Microbalance to a precision of 0.01milligramsinstalled in a chamber with controlled temperature and relative humidity.

The results of gravimetric and statistical analysis showed that there is a correlation of 99% for PM10-24h between SFU and TEOM. For the day periodthe correlation is 99%, and for the night period the correlation is 95%. There is a correlation of 95% for PM2.5-24h between Partisol andTEOM; for the day period the correlationwas 99% and for the night period was 95%. No correlation was foundbetween SFU and Partisol or TEOM, probably due to the different cut offdiameter.

The results show the feasibility of using the SFU and the Partisol samplers forquantification of PM10 in placeswhere there are no instruments of the monitoring network or at sub-urban places far from large cities;also those instrument could be used tocontrol anthropogenic sources. This can help the development of better public policiesto improve air quality in cities.

This work will continue with the study of the physical and chemicalcomposition. of the quantifiedPM.

P5.21 - CLIMATOLOGIES OF THE PURE TROPOSPHERIC OZONE AND CARBON MONOXIDE DERIVED FROM MOZAIC/IAGOS: A COMPARISON WITH SATELLITES AND MODEL RESULTS IN THE NORTHERN HEMISPHERE.

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In this study, we present the new and comprehensive “pure” tropospheric climatology of ozone (O3) and carbon monoxide (CO) in the northern hemisphere derived from the MOZAIC/IAGOS program in terms of seasonal-mean profiles and the monthly-mean column contents, with in addition the boundary layer, mid-troposphere and upper-troposphere partial columns contents (Zbinden et al., 2013). Each vertical profile (based on the ascent or descent phase of aircraft flights) is fully defined over the whole troposphere from the surface up to the dynamical tropopause at 2 pvu, excluding stratospheric contaminations but not stratospheric intrusions. The potential vorticity pressures to locate the tropopause are extracted from the operational European Centre for Medium-Range Weather Forecast (ECMWF) analyses (T213), and interpolated for the specific aircraft position with a 150 m vertical resolution. The climatotogies from the MOZAIC/IAGOS calibrated data explore more than seventeen years for O3, i.e. more than 50 000 O3 profiles, and ten years for CO, with a 50 m vertical resolution. The presentation highlights the most interesting characteristics of the troposphere for both species on sites sampled by MOZAIC/IAGOS, located from [24-50° N] and [119° W – 140° E]. The pure tropospheric climatology is compared with products derived from satellites using OMI/MLS, TES, AIRS and MOPITT and with Chemical Climate Model results. Striking features on Asian sites will be discussed. This study contributes to evaluate the impact of anthropogenic activities and the inter-annual variability of O3 and CO at the northern hemispherical scale.

P5.22 - QUANTIFICATION OF AIRBORNE BACTERIA BY AEROSOL MASS SPECTROMETRY IN URBAN AND RURAL ENVIRONMENTS

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Airborne bacteria may harm human health and certain strains are among the most efficient ice nuclei known so far. Since they can also act as cloud condensation nuclei they possibly influence the local hydrological cycle in pristine regions such as the tropical rainforest. However, their contribution to the particulate organic nitrogen budget and to total organic aerosol mass is highly uncertain because the prevalent analysis of colony forming units detects neither non-cultivable cells nor cell fragments. Meanwhile, available online techniques are often not specific to bacteria, yielding ambiguous results.

We present a method which facilitates the separation of airborne bacteria from other constituents of non-refractory organic aerosol employing an Aerodyne high-resolution time-of-flight aerosol mass spectrometer equipped with a newly developed PM2.5 aerodynamic lens. The size and the chemical composition of common ice-nucleation active Pseudomonas bacteria were analyzed in chamber experiments at the AIDA facility in Karlsruhe, Germany. We demonstrate that the high-resolution mass spectra of the bacteria can be distinguished from those of the residual particles from the agar nutritive medium in which the bacteria were grown. Nitrogen-containing ions are the most characteristic features of the bacteria mass spectra and a combination of marker ions will be presented.

Positive matrix factorization using the multilinear engine (ME-2) was applied to quantify bacteria in ambient aerosol at an urban background site in Zurich (spring) and during mobile measurements in the Po Valley (summer). We estimate that airborne bacteria may contribute 0.2 - 2.0 μg m-3 to non-refractory PM2.5 at both sites.

P5.24 - INVESTIGATION OF FORMATION REACTION MECHANISM OF SOA FORMED BY PHOTOOXIDATION OF TOLUENE USING STABLE CARBON ISOTOPE RATIO MEASUREMENT

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To investigate reaction pathways leading to formation of secondary organic aerosol (SOA), compound-specific stable carbon isotope ratios for phenolic compounds in SOA formed by photooxidation of toluene were studied. SOA generated by photooxidation of toluene in a 2.5-dm3 continuous-flow reactor and an 8-m3 indoor smog chamber was collected on PTFE coated filters, and the samples were extracted with acetonitrile. Eight phenolic compounds were identified in the extracts by a gas chromatograph coupled with a mass spectrometer, and their compound-specific stable carbon isotope ratios were determined by a gas chromatograph coupled with a combustion furnace followed by an isotope ratio mass spectrometer. The majority of the products, including methylnitrophenols and methylnitrocatechols, were isotopically depleted by 5‰–6‰ compared to the initial isotope ratio for toluene, whereas the isotope ratio for 4-nitrophenol (a product that lost the methyl-group of toluene) remained the same as the initial isotope ratio for toluene. Based on the reaction mechanisms postulated in literature, stable carbon isotope ratios of these products were calculated. Comparison of the observed isotope ratios with the predicted isotope ratios for phenolic products are discussed in this presentation.

P5.25 - VERTICAL DISTRIBUTION OF HOX CONCENTRATIONS DRIVEN BY BOUNDARY LAYER DYNAMICS

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The hydroxyl (OH) and hydroperoxy (HO2) radicals are key compounds for the degradation of pollutants in the atmosphere. Therefore, accurate and precise measurements of HOx radicals (= OH + HO2) at different altitudes and in different regions are necessary to test our understanding of atmospheric chemical processes. The planetary boundary layer (PBL) is of special interest as it is chemically the most active part of the atmosphere. Until today, there is a general lack of measurements investigating the distribution of radicals, trace gases, and aerosols in the PBL with high spatial resolution. Here, we present results of measurements performed in June/July 2012 in the Po valley region in Italy as part of the Pan-European Gas-AeroSOls-climate interaction Study (PEGASOS). A Zeppelin NT was used as an airborne platform for measurements of HOx radical concentrations and total OH reactivity (kOH) applying a remotely controlled Laser Induced Fluorescence (LIF) instrument. In addition a comprehensive set of other trace gases (O3, CO, NO, NO2, HCHO, HONO, VOCs), photolysis frequencies, particle number concentration, and meteorological parameters were measured. During the morning hours, a layered atmospheric structure with vertical gradients in trace gas concentrations was observed. In altitudes larger than 600 m above ground, air masses with low trace gas concentra-

tions (NOx < 500 ppt, kOH < 3 s-1) were probed, whereas air masses in altitudes below 100 m above ground were influenced by ground emissions resulting in higher trace gas concentrations (NOx > 6 ppb, kOH > 6 s-1). The airship Zeppelin NT was used to perform localized height profiles between 75 and 900 m above ground in order to investigate the influence of these trace gas gradients on HOx radical concentrations. Due to changing chemical conditions, the measured OH concentration shows a variability with height up to a factor of 2.5 and for the measured HO2 concentration up to a factor of 5. Additionally, we present box model calculations of HOx to identify the processes driving the radical chemistry and its change in concentration with height.

P5.26 - UV IRRADIANCE AND AOD VARIATION IN THE NAHUEL HUAPI NATIONAL PARK (PATAGONIA, ARGENTINA) AFTER THE ERUPTION OF PUYEHUE- CORDON CAULLE (CHILE)

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On June 4th, 2011, the Puyheue-Cordon Caulle volcanic complex (40°35’25?S 72°07’02?W,) started eruption, sending ash 45,000 feet into the atmosphere. After the initial period, the eruption continued for several months, with less intensity. Changes in global irradiance in the UV-B and UV-A, and direct irradiance and AOD in the UV-A, as consequence of the eruption, were studied. Global irradiance has been permanently measured at the Laboratory of Photobiology (LPh) (41.13S, 71.42W, 804m.s.l.) since 1998. In addition, in the frame of a project to study altitude effect on direct and global irradiance, field campaigns were performed during September 17th to 23rd, 2010 and September 14thto 18th, 2011, in the region of the , near 100 km from the eruption. In those periods, simultaneous measurements of direct and global irradiance and aerosol optical depth (AOD) were carried out at three sites: Laboratory of Photobiology (LPh), Mt Otto (41.15S, 71.38W, 1386m.s.l.) and Mt Catedral (41.17S, 71.48W, 1930m.s.l.). The analysis of aerosols in 2011, three to four month after the eruption started, showed the presence of larger particles and more variability than in 2010, at all sites. Global irradiance, at LPh, also exhibited larger variability, compared to 1999, when no eruption or any other event that could have produced major changes in aerosols occurred. The mean decrease, as consequence of the volcano activity, at LPh, was around 20%, at 305 nm and closed to 10%, at 320 nm. At 380 nm, the decrease was very small and not statistically significant, although in particular days, with large aerosol load, a significant decrease was observed. Direct irradiance, in the UV-A, showed larger decrease than global irradiance. The effect of the eruption was more pronounced at the low altitude site. This study did not use GAW data, but shows the importance of collecting background data, as is the case for GAW stations.

P5.27 - EXPERIMENTAL RATE COEFFICIENT FOR THE REACTION OF OH RADICAL WITH (Z)-3-HEXENE AT 298K

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The volatile organic compounds (VOCs) are emitted into the tropospherereby both biogenic and anthropogenic sources, playing an important role inatmospheric chemistry. VOCs reactions lead to a complex series of chemical andphysical transformations which result in the formation of ozone and oxygenatedcompounds. It is now well recognized that a wide variety of volatilenon-methane organic compounds are emitted into the atmosphere from vegetation,mainly by forests 1. Hexenol and other unsaturated alcohols aremainly emitted by vegetation. Other unsaturated compounds are of anthropogenicorigin, such as hexenes. These compounds are used in the production ofpolymers. The main goal of this work was the study of OH radical + (Z)-3-hexenereaction for a further comparison with its alcohol homologue.

The kinetics of the reaction at 298 K and atmospheric pressure wasinvestigated using the relative rate method. The experimental set-up at INFIQC(Argentine) consisted of an 200 L Teflon bag located in a wooden box with theinternal walls covered with aluminum foil, and operated at atmospheric pressureand 298 K. OH radicals were produced by the photolysis of H2O2 at254 nm using five germicide lamps. The mixtures of (Z)-3-hexene and referencecompounds with H2O2 were stable in the dark whenleft in the chamber for about 2 h. Moreover, no photolysis of (Z)-3-hexene orreferences was observed. Photolysis was carried out in steps of 2 min, and thetotal time of photolysis varied from 2 to 12 min. Periodically, gas sampleswere removed from the Teflon bag using calibrated gas syringes and analyzedusing the GC-FID. Relative rate coefficients were determined by comparing therate coefficients for the reaction of OH radicals with the target compound tothat with three reference compounds (cyclohexene, 2-buten-1-ol and allylether). The mean value for the second-order rate coefficient was (0.6±0.1) x 10-10cm3 molécule-1 s-1 ingood agreement with the previous reported value 2.

References:

1Guenther, A.; Geron, C.; Pierce, T.; Lamb,B.; Harley, P.; Fall, R. 2000. Atmos. Environ., 34, 2205-2230.

2Grosjean, D.; Williams II, E. L. 1992.Atmos.Environ., 26, 1395-1405.

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P5.28 - RECENT DEVELOPMENTS IN PROTON-TRANSFER-REACTION TIME-OF-FLIGHT MASS SPECTROMETRY (PTR-TOFMS)

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Extremely short response times in the 100 ms regime,real-time quantification capability, high mass resolution and high sensitivityhave made Proton-Transfer-Reaction Time-of-Flight Mass Spectrometry (PTR-TOFMS)a well established technology in the field of atmospheric chemistry. Herewe give an overview of very recent developments in PTR-TOFMS and their applicationsin environmental research.

In PTR-MS water vapor is converted into H3O+in a hollow cathode ion source, which is subsequently injected into a drifttube together with sample air containing the trace compounds; i.e. neither amass filter between the ion source and the drift tube nor any samplepreparation is necessary. In recent embodiments of PTR-MS instrumentsadditionally NO+, O2+, Xe+ and Kr+,respectively, can be utilized as reagent ions. This seriously increases thetechnology's selectivity and enhances the number of detectable substanceclasses. Another novel development in PTR-TOFMS instruments is theintroduction of a quadrupole ion guide between the drift tube and the massspectrometer. We present measurement data of certified gas standards that provethat this ion guide (in combination with an elevated pressure in the drifttube) increases the product ion transmission and thus the sensitivity by morethan a factor of 20, i.e. from about 200 cps/ppbv in common instrumentsequipped with a transfer lens system to about 4,700 cps/ppbv. This sensitivityincrease results in improved Limits-of-Detection (LoD). At a dwell time of 100ms, which corresponds to the sampling frequency typically used in fluxmeasurements (10 Hz), the LoD of the novel PTR-TOFMS instrument is already at20 pptv and after 1 min integration time LoD values of some hundreds of ppqv(parts-per-quadrillion) can be reached.

P5.29 - THE FATE OF STABLISED CRIEGEE INTERMEDIATES UNDER ATMOSPHERIC BOUNDARY LAYER CONDITIONS

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The products of alkene ozonolysis have been shown in field experiments to convert SO2 to H2SO4. One fate of H2SO4 formed in the atmosphere is the formation of sulphate aerosol. This has been reported to contribute -0.4 Wm/2 to anthropogenic radiative forcing via the direct aerosol effect and also to contribute to the indirect aerosol effect, a substantial uncertainty in climate modelling.

The observed SO2 oxidation has been proposed to arise from reactions of the carbonyl oxide, or Criegee Intermediate (CI), formed during alkene ozonolysis reactions, with SO2. Direct laboratory experiments have confirmed that stabilised CIs (SCIs) react more quickly with SO2 than was previously thought. The major sinks for SCI in the troposphere are decomposition and reaction with water vapour. The importance of the SO2 + SCI reaction in H2SO4 formation has been shown to be critically dependent on the ratio of the rate constants for the reactions of the SCI with SO2 and H2O.

Here we present results from a series of ozonolysis experiments performed at the EUPHORE atmospheric simulation chamber, Valencia. These experiments measure the loss of SO2, in the presence of an alkene/ozone system, as a function of water vapour, under realistic atmospheric boundary layer conditions. From these experiments we quantify the relative rates of reaction of SCI with water and SO2, and their decomposition rates. In addition the results appear to suggest that the conversion of SO2 to H2SO4 during alkene ozonolysis may be inconsistent with the SCI + SO2 mechanism alone, particularly at high relative humidity.

P5.30 - DEVELOPMENT OF A CAVITY ENHANCED AEROSOL ALBEDOMETER

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Aerosol single scattering albedo (SSA, w), defined as the ratio of the aerosol scattering (ascat) to its extinction (aext) coefficient, is an important parameter that governs the relative strength of the aerosol scattering and absorption capacity. The in-situ accurate measurement of SSA is a key challenge in atmospheric science and climate change research.

We report on the development of a cavity enhanced aerosol single scattering albedometer incorporating incoherent broad-band cavity-enhanced spectroscopy (IBBCEAS) approach and an integrating sphere (IS) for simultaneous in-situ measurements of aerosol scattering and extinction coefficients on the exact same sample volume. Truncation reduction tubes were used to minimize the truncation angle (reduced to be within ~ 1.2º for the forward (backward) truncation angle), which was toward the nearly ideal integrating nephelometers.

The cavity enhanced albedometer employed a blue light-emitting diode (LED) based IBBCEAS approach for the measurement of wavelength-resolved aerosol optical extinction over the spectral range of 445-480 nm. An integrating sphere nephelometer coupled to the IBBCEAS setup was used for the measurement of aerosol scattering. The scattering signal was measured with a single channel photomultiplier tube (PMT), providing an integrated value over a narrow bandwidth in the spectral region of 465-474 nm. Performance evaluation of the albedometer was carried out using laboratory-generated particles and ambient aerosol. Intercomparisons of the developed cavity enhanced albedometer were carried out using a Thermo 42i NOx analyzer for NO2 concentration measurement and a TSI 3563 nephelometer for aerosol scattering coefficient measurement. The good agreement observed in these instrumental intercomparisons demonstrated that the developed albedometer provided a robust method for direct and simultaneous measurement of aerosol scattering and extinction coefficients (and then SSA), as well as absorbing gas concentrations.

P5.31 - MODELING THE HETEROGENEOUS REACTION OF NO2 ON THE SURFACE OF CALCIUM CARBONATE

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Aerosols play central roles in atmospheric chemistry andphysics. While a number of laboratorial researches have been conducted on theheterogeneous reactions on aerosol particles, the application of these resultsin atmospheric models is very limited. This is partly due to the inconsistentuptake coefficient measured at different lab studies. Parameterization of theuptake coefficient could help to improve this problem.

In this study, a parameterization scheme was developed for NO2reaction uptake coefficient on the surface of CaCO3. NO2is a gas active gaseous pollution in the troposphere, as the major compositionin Arian Dust and construction dust, CaCO3, is one of the majorcompositions in urban aerosols in China.

The reactionwas investigated at 296K in laboratory with Raman Microscopy, and the influence of relative humid on the reactionwas investigated. It was found that there were significant difference on reactionextent, uptake coefficient and morphology change under different RH. The reactiveuptake coefficient of reaction of NO2 with individual CaCO3particles is 2~3 orders of magnitude higher than that of bulk CaCO3 powder. Thereactive uptake coefficient was neglecting under dry condition.

The process of thereaction was separated into several steps including mass transfer in gas phase,between gas-liquid, in liquid, dissolution of CaCO3, and hydrolysisof NO2. Then, a process model, which was based on the PRA frameworkof gas-particle interactions, was built to simulate the reaction curve. Aparameterization scheme was developed for the NO2 reaction uptakecoefficient on the surface of CaCO3.

P5.32 - VOLATILITY MEASUREMENTS OF ALKYLAMINIUM SALTS

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Atmospheric aliphatic alkylamines are ubiquitous volatileorganic compounds originating from anthropogenic and biogenic sources andactivities that have been found in field measurements of nucleation andsubmicron mode particles. One of the main degradation pathways of alkylaminesin the atmosphere is acid-base reactions with acids. The reaction lowers thevapor pressure (of both precursors) and promotestheir gas to particle partitioning. In this study we present the volatility dataof alkylamines salts of sulfuric, monocarboxylic (acetic, propionic andpentanoic) and dicarboxylate (succinic, adipic, azelaic and malic acids) acids.Volatility is measured in the laboratory with a thermal denuder and calculatedbased on the kinetic theory of evaporation.

We found that the vapor pressure of alkylaminium salts vary significantly.The vapor pressure of alkylaminium sulfate salts is 1-3 orders of magnitudelower than that of ammonium sulfate (2.7×10-9Pa)and the vapor pressure of alkylaminium dicarboxylate range between 10-5Paand 10-6Pa. This suggests that alkylaminium sulfate salts willsignificantly contribute to new particle formation and growth while thecontribution of alkylaminium dicarboxylate which are semi-volatile, is expectedto be lower. The volatility measurementsof alkylaminium carboxylate salts show have greater thermal stability thanexpected and their thermograms did not follow the kinetic model. To betterunderstand their irregular volatility, we measured their density and viscosityand also characterized them by NMR and DSC measurements. We found that thesesalts are room temperature protic ionic liquids, which may consist of a mixtureof the molecular species and ionic salts and hence have irregular volatilitybehavior.

This study furthers our knowledge on the gas-particlepartitioning of secondary organic aerosols. The characterization of alkylaminiumcarboxylate as ionic liquids has possible implication for their chemicalreaction pathways in the atmospheres and as well as in laboratory that needs tobe further explored.

P5.33 - KINETIC STUDY OF BROMINE RELEASE FROM HETEROGENEOUS REACTIONS OF GASEOUS OZONE WITH AQUEOUS BROMIDE SOLUTION

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It has been reported that bromine chemistry has a significant impact on tropospheric chemistry in the mid-latitude regions as well as in the polar regions because ozone in the marine boundary layer can be destroyed through catalytic reaction cycles involving bromine radicals, which are photolytically produced from photolabile species such as molecular bromine, Br2(g). The production of Br2(g) from heterogeneous reactions between gaseous ozone, O3(g), and bromide ions, Br−(aq), in a sea-salt particle can contribute to an initial release of reactive bromine under dark conditions. Many laboratory studies have examined the heterogeneous reaction between O3(g) and Br−(aq), and proposed its reaction mechanisms based on bromine chemistry in the bulk solution phase. Although recent studies have indicated the possibility of the involvement of interfacial reactions on aqueous surface, their rates and mechanisms are still not fully understood.

In this study, we investigated Br2(g) production from the heterogeneous reaction between O3(g) and Br−(aq) at room temperature in a wetted-wall flow tube reactor. Concentration of Br2(g) was measured by a negative ion chemical ionization mass spectrometer using SO2Cl− as a reagent ion. The Br2(g) production rates were determined as functions of O3(g) concentration (0.1–4 ppmv), Br−(aq) concentration (0.005−0.02 M), and pH (1.8–12). While the dependence of the Br2 production rates on the Br−(aq) concentration is well described by the reaction kinetics in the bulk solution, the pH dependence shows a different behavior from that expected from the bulk phase chemistry. The possibility of surface chemistry and its reaction mechanism will be discussed.

P5.34 - STUDY OF SECONDARY ORGANIC AEROSOL FORMATION FROM OZONOLYSIS OF UNSATURATED HYDROCARBONS

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Secondary organic aerosol, SOA, constitutes a substantial fraction of atmospheric fine particulate matters and has an effect on visibility, climate, and human health. One of the major oxidizing processes leading to SOA formation is an ozonolysis of unsaturated hydrocarbons, UHCs. Despite of its importance, the contribution of the ozonolysis of UHCs to the SOA formation in the troposphere is not sufficiently understood due to a lack of information on reaction pathways to produce low volatile compounds.

We have investigated SOA formation from ozonolysis of UHCs in a Teflon bag reactor using a negative ion chemical ionization mass spectrometry, NI-CIMS, for product analysis. Previously, we reported gas-phase oligomer formation by stabilized Criegee intermediates, SCIs, leading to SOA formation in ethylene ozonolysis, the simplest alkene.

In this study, we investigated SOA formation from the ozonolysis of other UHCs than ethylene. The gas-phase oligomer formation and subsequent SOA formation were also observed in the ozonolysis of other UHCs. This was confirmed by adding water vapor or methanol as an SCI scavenger. We also examined effects of OH radical scavengers on the SOA formation and found that some scavengers such as cyclohexane can be involved in reactions leading to SOA formation. Mechanisms of such scavenger effects will be discussed with the aid of the product analysis by NI-CIMS.

P5.35 - MISSING GAS-PHASE SOURCE OF HONO INFERRED FROM ZEPPELIN MEASUREMENTS IN THE TROPOSPHERE

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Nitrous acid (HONO) is an important trace gas in the troposphere due to its contribution to the cycles of nitrogen oxides (NOX) and hydrogen oxides (HOX). In the past decades, ground-based observations of HONO around the world showed much higher daytime concentrations than can be explained by the known gas-phase chemistry (i.e., HONO + hv -> OH + NO, HONO + OH -> NO2 + H2O, OH + NO + M -> HONO + M). Direct light-dependent reactions on ground surfaces have been proposed as additional daytime HONO sources. However, due to lack of measurements, little is known about the concentrations of HONO and its sources in the planetary boundary layer (PBL) at higher altitudes above the earth's surface. The airship Zeppelin NT is an ideal platform to investigate the chemistry and dynamics of the PBL. During the PEGASOS field campaigns in 2012 and 2013, HONO and its gas-phase sources and sinks were measured simultaneously on-board the airship Zeppelin NT, for the lowest 1km of the PBL. In the upper part of the altitude range during morning hours, when the airmass is still isolated from processes at the earth's surface by temperature inversion, we find unexpectedly high concentrations of HONO which can neither be explained by heterogeneous reactions on aerosol and on ground surfaces, nor by known gas-phase reactions. Our observations show evidence for an unknown gas-phase HONO production which dominates the overall HONO formation in the lower troposphere. This new HONO source requires NOX and possibly OH or HO2 radicals. As a result, the general impact of HONO on the OH formation is likely overestimated.

P5.36 - ROLE OF WET SCAVENGING IN DC3 OKLAHOMA AND ALABAMA THUNDERSTORMS USING RESULTS FROM WRF-CHEM SIMULATIONS

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In deep convective storms, wet scavenging of soluble species, as well as aqueous and ice chemistry, affects the net transport of HOx precursors to the upper troposphere (UT), and thus UT O3 production, air quality and climate. The DC3 (Deep Convective Clouds and Chemistry) field campaign took place in the central US from May-June 2012 and sampled inflow and outflow of convective storms with different dynamical and emission characteristics.This work compares wet scavenging of soluble trace gases in the DC3 May 29 Oklahoma supercell and May 21 Alabama airmass thunderstorms. WRF-Chem simulations at cloud resolving scales (dx=1km) are conducted with two different wet scavenging schemes. The first scheme, based on Neu and Prather (ACP, 2012) tracks dissolved species in cloud droplets and precipitation and releases species to the gas phase from evaporating precipitation. However, it does not distinguish between precipitating liquid and ice, and uses a constant retention fraction for soluble species during hydrometeor freezing. The second, described in Barth et al. (JGR, 2001), tracks solute in individual liquid and frozen hydrometeors. Anew capability to specify the fraction of each species that is retained in ice upon hydrometeor freezing has been added. Vertical distributions of trace gases with varying solubilities within the storm and immediately surrounding the storm are compared with observations from the GV and DC-8 aircraft in storm inflow and outflow regions. Using the Neu and Prather scheme, observed mean vertical profiles of some soluble species (H2O2, CH2O,CH3OOH) in outflow are better represented in the model with scavenging. However, missing aqueous sinks (SO2, H2O2) and possibly too much ice deposition of HNO3 motivate further model development of the explicit wet scavenging scheme. Aqueous chemistry, variable ice retention factors and an improved ice deposition scheme are included in the Barth scavenging scheme to improve the model representation of convective cloud transport and processing of chemical species. Scavenging efficiencies are calculated from the model by several flux methods and compared with scavenging efficiencies derived from observations for the Oklahoma and Alabama storms.

P5.37 - ONE IN A MILLION: CONTRASTING RESULTS FROM PHOTOCHEMICAL BOX MODELS WITH 3D CHEMISTRY-CLIMATE MODELS

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Chemistry-Climate models are increasingly being used to ask questions such as: How will air quality change under future emission scenarios? Many members of the atmospheric chemistry community who focus on air quality related issues have a specific interest in simulating levels of near surface ozone (O3), as this is a major component of photochemical pollution. The problem of simulating secondary oxidants, such as O3, is as old as the science of modelling atmospheric chemistry itself. One of the most widely attributed causes of model disagreement - a key factor in our acknowledged understanding of the problem - has been in the parameterisations of atmospheric chemistry, the so-called chemical mechanism, applied in models.In this contribution we will present a new method to compare the results of boxmodel simulations with simulations from the output of chemistry-climate modelsthat participated in the IGAC ACCMIP project. In addition to the evaluation ofthe ACCMIP data, a number of experiments using the UM-UKCA chemistry-climatemodel have been performed whereby different emissions and chemistry schemeswere implemented in the model. By comparing the results of the UM-UKCAsimulations to a series of box model simulations, performed using the samechemical mechanisms, we are able to identify key processes that contribute tothe differences that arise in the UM-UKCA simulations.

P5.38 - SOUTH AFRICAN COAL FIRED POWER STATION EMISSIONS: THE PRESENT, THE PAST AND THE FUTURE

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P5.39 - CONTINUOUS MEASUREMENTS OF PEROXY AND ORGANIC NITRATES AT SUZU, THE NOTO PENINSULA, JAPAN

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Peroxyacyl nitrates (PANs) and alkyl nitrates (ANs) act as one of the reservoirs of nitrogen oxides (NOx) in the atmosphere. Since their lifetime is longer than that of NOx, they can be transported over a long-distance and would be important as transboundary pollutants. Continuous measurement system of total PANs and ANs in the troposphere has been developed by using a thermal dissociation/cavity attenuated phase shift spectroscopy (TD/CAPS) method. Both PANs and ANs are thermally decomposed to produce NO2 and then NO2 is measured by CAPS method. This system can observe PANs and ANs with high time resolution while this system cannot separate constituents of PANs and ANs. Total PANs and ANs can be measured separately by setting up decomposition lines at different temperatures.

Continuous field observations of PANs and ANs concentrations have been being carried out at NOTOGRO (NOTO Ground-based Research Observatory) supersite in Suzu, Noto Peninsula, since November 2012. NOx, total odd nitrogen species (NOy), total inorganic nitrate (T.NO3), O3 and CO concentrations have also been being observed at NOTOGRO.

NOy concentrations were in agreement with the sum of observed NOy components (=NOx+T.NO3+PANs+ANs) regardless of seasons. NOx fractions were the highest in NOy constituents. T.NO3 fractions were small in winter and increased in spring. Opposite tendencies were observed for PANs fractions. These reflect that wet deposition of T.NO3 is promoted in winter and temperature increasing accelerates decomposition of PANs.

Seasonal variations of both PANs and ANs concentrations showed spring maximum and summer minimum. From winter to spring, both PANs and ANs concentrations from Korea-China air mass origin were higher than those from the other air mass origins. On the other hand, both PANs and ANs concentrations were independent of air mass origins from spring to summer. These indicate that PANs and ANs concentrations in winter and spring are governed by long-range transport and local photochemical productions of PANs and ANs are relatively important from spring to summer. In addition, PANs and ANs diurnal variations being high and low in the daytime and nighttime, respectively, in spring and summer also imply the local photochemical productions of PANs and ANs.

P5.40 - ASSESSMENT OF GLOBAL PRECIPITATION CHEMISTRY BY THE WMO GLOBAL ATMOSPHERE WATCH PROGRAM

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Secondaryorganic aerosol (SOA) is formed due to the condensation of the low volatileproducts of the volatile organic compounds (VOCs) oxidation on preexistingparticles. Monoterpene SOA may contribute up to 50% of the total organicaerosol (OA) in certain areas, with a-pinene being one of the most importantprecursors. Ambient OA is often dominated by oxidized OA (OOA) both in remoteand urban areas, as the oxidative nature of the atmosphere (OH radicals) andthe photochemical conditions tend to age the OA. Atmospheric models sometimesunderestimate OA mass concentrations especially during summertime. Includinganthropogenic SOA aging (through OH radicals) has closed that gap betweenmodels and field observations better. However, when biogenic SOA aging throughOH radicals is taken account some models tend to overpredict the OA mass. Thus,there is a discrepancy between models and field measurements, which needs to beaddressed.

P5.41 - CLOSING THE OH BUDGET FOR ISOPRENE, METHACROLEIN, AND METHYL VINYL KETONE OXIDATION DURING SIMULATION EXPERIMENTS IN SAPHIR

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During recent field campaigns, measured hydroxyl radical (OH) concentrations were upto a factor of ten larger than predicted by current chemical models for conditions of high OH reactivity and low nitrogen monoxide (NO) concentrations.These discrepancies were most often observed in forests, where concentrations of biogenic volatile organic compounds (BVOCs) were large. We investigated the radical budget during oxidation of VOCs with OH including a full set of accurate and precise radical measurements in the atmosphere simulation chamber SAPHIR in Juelich, Germany.The conditions during thechamber experiments were comparable to those during field campaigns with respect to radical and trace gas concentrations. In particular, OH reactivity was high (up to 30 per second) and NO mixing ratios were as low as 200pptv. VOC species included the most important single compound isoprene, and its major oxidation products methacrolein (MACR) and methyl vinyl ketone (MVK). Significant gaps between measured OH destruction and production pathways were found for isoprene and methacrolein. The additional OH needed to close the OH budget is consistent with recently proposed reaction mechanisms suggesting OH production from isomerization and decomposition reactions of organic peroxy radicals produced in the reaction of OH with VOCs.

P5.43 - FORMATION AND AGING OF SECONDARY ORGANIC AEROSOL DURING THE SS-CARYOPHYLLENE OXIDATION

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Beta-caryophyllene ($C15H24$) is a biogenic sesquiterpene which is emitted in the atmosphere in significant quantities and can produce secondary organic aerosol (SOA) after being oxidized. We investigate the secondary organic (SOA) production during the oxidation of ß-caryophyllene using the Carnegie Mellon environmental chamber. Both the initial formation of SOA and the subsequent chemical aging of the SOA products are investigated. Experiments were conducted with two different oxidants: ozone, hydroxyl radicals following the aerosol chemical composition with a HR-ToF-AMS. The ability of ß-caryophyllene to form SOA was quantified as a fractional aerosol mass yield. Chemical aging of the SOA was studied by exposing the particles to high concentrations of hydroxyl radicals. The effect of relative humidity in the formation and aging of the SOA was investigated. We also quantified the evaporation rates of ß-caryophyllene SOA by using a thermodenuder. The corresponding volatility distributions of the products and an effective vaporization enthalpy were estimated.

P5.44 - AEROSOL SOURCE APPORTIONMENT IN LEPHALALE, SOUTH AFRICA

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Our results indicate that the increase in the SOA mass due to the aging is lessthan 25%, which is lower than reported in the few previous studies. The resultsare sensitive to low levels of organic contamination from the distilled wateror from plastic parts of the injection system that react with OH producingorganic aerosol. The role of the OH exposure, source of OH, relative humidityand NOx levels have been quantified together with the correspondingchanges in O:C, particle hygroscopicity, and volatility.

P5.45 - GLOBAL DISTRIBUTION OF ORGANIC MASS TO ORGANIC CARBON RATIO IN ATMOSPHERIC AEROSOLS

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Organiccompounds play an important role in atmospheric chemistry and affect Earth'sclimate through their impact on oxidants and aerosol formation (e.g. O3 andorganic aerosols). Organic compounds in addition to C may contain H, O andpotentially other elements like N, S and P, thus the organic-mass-to-organic-carbonratio (OM/OC) exceed unity. Due to the complexity of the mixture of organics inthe atmosphere, this ratio is often used to characterize the organic component inatmospheric aerosols since it varies with aerosol origin and the chemicalprocessing in the atmosphere. Atmospheric observationshave shown that as organic aerosols and its precursor gases age in theatmosphere, it leads to the formation of more oxidized (O:C atomic ratio 0.6 to0.8), less volatile and less hydrophobic compounds (particle growth factor at95% relative humidity of 0.16 to 0.20) that have more similar properties thanfresh aerosols. While reported OM/OC ratios observed over USA range between1.29 and 1.95, indicating significant contribution of local pollution sourcesto the OC in that region, high O/C ratio associated with a high OM/OC ratio of2.6 have been also observed in Europe.

In global models, the OM/OCratio is either calculated for specific compounds or estimated for compoundgroups. In the present study, we review OM/OC observations and compare themwith simulations from a variety of models that contributed to the AeroCom OAevaluation. We examine the chemical processing level of atmospheric aerosolssimulated by the models. A total of 31 global chemistry transport models areconsidered in this study with variable complexity of the representation ofOM/OC ratio in the organic aerosols. The analysis provides an integrated viewof the OM/OC ratio in the global atmosphere and of the accuracy of itsrepresentation in the global models. Implications for atmospheric chemistry andclimate simulations are discussed.

P5.46 - SIMULATED NMR SPECTRA FOR SECONDARY ORGANIC AEROSOL (SOA) CHEMICAL CHARACTERIZATION

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Organiccompounds emitted in the atmosphere are oxidized in complex reaction sequencesthat produce a myriad of intermediates. Although the cumulative importance ofthese organic molecules is widely acknowledged, there is still a critical lack ofinformation concerning the detailed composition of the highly functionalizedsecondary organics in the gas and condensed phases. Elucidationof the chemical and physical processes underlying secondary organic aerosol(SOA) formation has been pursued using various experimental and modelingapproaches of different degree of complexity.

This study examines the use of simulatedproton-nuclear magnetic resonance (H-NMR) spectra as diagnostic for models ofbiogenic and anthropogenic SOA formation. Spectral fingerprints for selectedSOA systems – ozonolysis and photoxidation of a-pinene and photoxidation of1,3,5-trimethylbenzene (TMB) – were recorded for samples of SOA collectedduring reaction chamber experiments. The simulation of H-NMR spectra startingfrom model compositions was carried out using ACD/Labs algorithms testedagainst their ability to reproduce the spectra of standard compounds, includingmolecules possessing a complex stereochemistry like the oxidation products ofa-pinene. Simulated spectra were recorded for model mixtures comprisingcompounds derived from literature studies of GC/MS and LC/MS characterization,as well as compounds expected to occur in SOA based on explicit gas-phasechemistry models for a-pinene and TMB. In particular, a set of chemical speciesfrom the Master Chemical Mechanism (MCM) was selected, based on simpleassumptions about their expected volatility, to account for the uncharacterizedfraction of SOA.

Theanalysis provides candidate basic structures for the SOA fractionuncharacterized at the molecular level. The results show also that compoundsbearing double bonds were very unlikely to occur in both a-pinene and TMB SOAsamples. These findings indicate that H-NMR spectroscopy can be used as a new,useful diagnostic tool for SOA formation models including explicit chemistry.

P5.47 - SOA FORMATION FROM BIOGENIC VOCS – CHEMICAL COMPOSITION AND INFLUENCE OF THE REACTION CONDITIONS

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Monoterpenesare the second most important group of the biogenic volatile organic compounds(BVOCs). Their oxidation yields products with multiple functional groups whichcan partition into the particle-phase and hence contribute to the formation ofsecondary organic aerosol (SOA). It is known that SOA formation is influencedby parameters such as relative humidity (RH), nitrogen oxides (NOx)and particle-phase acidity. Large uncertainties exist in the currentlyavailable literature data as their influences on the SOA formation contradicteach other. The overall aim of the present study was to obtain insights into their influences on the formation processes and chemical composition of SOA. Tofill the gap in the literature data, the SOA formation was investigated from thefirst generation oxidation products of the two most important monoterpenes,namely pinonaldehyde originating from a-pinene and nopinone from ß-pinene. Inthese experiments, experimental conditions such as RH (0%, 50%, 75%), seedparticle acidity (neutral and acidic) and NOx mixing ratio (˜100 pptand 100 ppb) were varied and the formed SOA was characterised with regards to(i) SOA yield and (ii) particle growth. It was found that in addition to thereaction conditions the chemical structure of the precursor compound is veryimportant for the SOA formation. It was observed that SOA formation from theoxidation of an aldehyde was considerably influenced by the presence of NOxwhereas SOA formation from the ketone oxidation was influenced by all of theinvestigated experimental conditions.

Furthermore, it was found thatall the ß-pinene oxidation products can be explained by the further oxidationof nopinone whereas two important SOA marker compounds of a-pinene, namelyterpenylic and pinic acid, could not be explained by further reaction ofpinonaldehyde. These missing SOA marker compounds were likely the reason forthe considerably smaller pinonaldehyde SOA yields (YSOA: 5%) thanthose of nopinone (YSOA: 25%).

SESSION 6: ATMOSPHERIC CHEMISTRY IN A CHANGING CLIMATE

P6.1 - DECADAL TRENDS IN TROPICAL WETLAND AND FIRE CH4 EMISSIONS

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Large unknowns preside over the future atmospheric methane budget:in the tropics, a wetter climate could result in increased wetland expanse, whilea drier climate could lead to an increase in biomass burning emissions. We use multiplesatellite derived data-streams to constrain inter-annual changes in wetland andfire emissions: we use atmospheric concentrations retrievals of CO – a proxy forbiomass burning emissions - and CH4 from the Aura TES instrument to de-couplewetland and biomass burning CH4 contributions to the atmosphere. We relate TESCH4:CO anomalies to inter-annual trends in GRACE equivalent water thickness, MODISburnt area, SCIAMACHY and GOSAT CH4 retrievals, and sea surface temperaturesduring 2003-2012; based GOSAT fluorescence measurements, we evaluate the effectof gross primary production on inter-annual variations in wetland and fire CH4emissions. Ultimately, the large-scale decoupling of wetland and fire CH4emissions will help constrain the short and long-term dynamics of the global atmosphericmethane budget.

P6.2 - STOCHASTIC MODEL AND ANALYZE TRENDS OF UV INDEX AND TOTAL OZONE IN NATAL-RN-BRAZIL

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The objective of this work is to model statisticallyand stochastic the ultraviolet radiation index (UV Index) to make forecast(extrapolate) and analyze trends. The task is relevant, due increased UV fluxand high rate cases of non-melanoma skin cancer (NMSC) in northeast of Brazil.The methodology utilized a Autoregressive Distributed Lag (ADL) or DynamicLinear Regression model. The monthly data of UV index were measured in eastcoast of the Brazilian Northeast (City of Natal). The Total Ozone is singleexplanatory variable to model and was obtained from the TOMS and OMI/AURAinstruments. The Predictive Mean Matching (PMM) method was used to completingthe missing data of UV Index. The results mean squared error (MSE) between theobserved UV index and interpolated data by model was of 0.36 and forextrapolation was of 0.30 and correlations of 0.90 and 0.91 respectively. Theforecast/extrapolation performed by model for a climatological period(2012?2042) indicated a trend of increased UV (Seasonal Man-Kendall test by t = 0.955 and p-value <0.001), while Total Ozoneremain on this current tendency to reduce. The model has a forecast increase ofalmost one unit of UV index to year 2042.

P6.3 - EVALUATION OF MULTI-MODEL SHORT-LIVED CLIMATE FORCER DISTRIBUTIONS OVER EAST ASIA USING IN-SITU REMOTE-SENSING, AND SATELLITE OBSERVATIONS DURING SUMMER 2008

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As part of the EU ECLIPSE (Evaluating the CLimate and air quality ImPacts of Short-livEd pollutants) project, which aims to quantify the climate impact of short lived climate forcers (SLCFs), including aerosols, black carbon and ozone, the WRF-Chem regional and six global (ECHAM6, EMEP,HadGEM, OsloCTM, NORESM, TM4) models are evaluated using observations in East-Asia. Simulations are compared at horizontal and vertical scales to satellite observations, as well as data from field campaigns which took place in summer 2008, and from long-term measurement stations. Models were run with the same emissions, namely, the ECLIPSE anthropogenic (based on the GAINSmodel), GFED 3.1 fire and RCP 6.0 ship and aircraft emissions for2008. The initial and boundary conditions for the WRF-Chem regional model were specified from the TM4 global chemical transport model.

Firstly, this study evaluates the ability of the models to simulate SLCFs, and their precursors, at a large scale, using monthly mean satellite observations such as IASI, MODIS, and CALIPSO. The latter, allows an evaluation of the vertical distributions of aerosols. Secondly, daily model results are evaluated at regional/local scales using ground-based data at urban and rural locations. Finally, the vertical distributions of trace gases and aerosols are evaluated using mean profiles from the CAREBEIJING summer 2008 airborne measurements over China, and lidar backscatter signals from the NIES network over Japan, respectively. The results highlight in general, that models reproduce ozone and ozone precursors columns reasonably well, while several models do not capture aerosol patterns, observed by MODIS AOD, especially over large urban areas.Surface comparisons show discrepancies between the different models for both trace gases and aerosols. Overall, models represent variability in trace species concentrations better at rural locations during the 2 month study period. Finally, the vertical distributions of trace gases and aerosols are underestimated, especially for very short-lived species such as NO2. other co-authors: S.-W. Kim, S. C. Yoon (SNU, Korea), M. Hu,J. Wang, T. Zhu (PKU, Beijing) + ECLIPSE modeling team

P6.4 - LONG-TERM AERONET REMOTE SENSING OBSERVATIONS IN AMAZONIA

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The Amazon represents the largest continuous rainforest in the world, and much attention has been devoted to studying thewidespread deforestation by agricultural clearing and man-made fires. In thewet season, the Amazon has very low concentration of particles, ranging from 200to 300 particles per cm3, typical of a continental pre-industrialatmosphere. However, biomass burning events result in significant seasonalaerosol loadings over vast stretches of the basin that increase the particleconcentration ranging from 10000 to 20000 particles per cm3, playingan important role in modifying the atmospheric composition. In this study, Amazonianaerosols optical properties including aerosol optical depth, sizedistributions, single scattering albedo and angstrom exponent, arecharacterized in detail by remote sensing observations from five AERONET globalnetwork stations, providing a regional and temporal overview. The observedsites such as Manaus, Ji-Paraná, Rio Branco, Manacapuru and Alta Florestainclude both a preserved forest as a heavily biomass burning impacted area. AerosolOptical Depth (AOD) at 550 nm of less than 0.1 is characteristic of naturalconditions over Amazonia. In the dry season, AOD550 values greaterthan 4 are frequently observed, constituting one of the largest AOD measures inall the AERONET stations, emphasizing the high impact of aerosols in Amazonia. Moreover,the aerosol absorption optical depth data (AAOD), a new product of AERONET, are beingstudying in parallel with black carbon (BC) concentrations measured by theAethalometer. By comparing both dataset, we expect to understand how the absorption aerosols impact theclimate in Amazon. These detailed analyses of aerosol optical properties fromlong-term AERONET monitoring sites can yield a complete characterization ofaerosol optical effects for a wide range of applications.

P6.5 - USING RENEWABLES TO POWER THE INFORMATION COMMUNICATIONS TECHNOLOGY (ICT) INDUSTRY TO SIGNIFICANTLY REDUCE THE GLOBAL CO2 FOOTPRINT

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To date, only 1% of global data has been processed. Yet global data is doubling every year, in large part due to the exponential growth of cloud services. The energy used to power the Information Communications Technology (ICT) industry is predominantly fossil fuel based. Further, most cloud providers use less than 20% clean renewable energy. This has significant implications for the global environment and the strain on existing and antiquated power grids. In fact, it's anticipated that total global CO2 generated directly from ICT will reach 4% by 2020 (source: McKinsey & Company).

Therefore, there is much to be gained from the adoption of the multiple renewable energy resources across the world, including climate change mitigation and economic benefits.

GreenQloud is a cloud solutions company specializing in actively reducing the CO2 footprint of the ICT industry by powering its public cloud services in key locations where renewable energy resources are readily available. Locations such as Iceland where clean 100% renewable energy is abundant; or the Pacific Northwest and Brazil where hydro and other renewables are ample, provide strategic geographical and GHG mitigation opportunities.

This presentation will focus on the global opportunities in using renewable energy. It will address how GreenQloud actively sources availability zones around the world where redundant connectivity meets readily available renewable energy, to strengthen both the business and environmental resilience of ICT, and to nurture the renewable energy market into mainstream.

GreenQloud's territories include sales channels in Iceland, the US, the Netherlands and Natal, Brazil where we also have support and development personnel. This presentation will provide an insight into our plans to expand the Brazil operations, including opening additional availability zones specifically to capitalize on Brazil's renewable energy, rich technical resources and strategic location, which will provide exceptional geo redundancy to our network. It will also address the need for strategic partnerships to create a sustainable future where both business practices and environmental responsibility benefit from clean, sustainable cloud technology.

P6.6 - EVALUATION OF O3 VARIABILITY IN THE TROPOSPHERE AND THE STRATOSPHERE FROM IASI OBSERVATIONS IN 2008-2013

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In this study, we present the daytime measurements of ozone during 6 years (2008-2013) observed by the IASI (Infrared Atmospheric Sounding Interferometer) instrument which provides a unique dataset of vertically-resolved O3measurements for studying time series and climatologies. The time development of O3 is characterized by fitting constant, annual and semi-annual terms, solar flux (SF) and quasi biennial oscillation (QBO) proxies to the IASI time series, separately in different layers over the stratosphere and the troposphere. We provide time series analysis of partial columns for the layers: ground-300hPa (troposphere),300-150hPa (upper stratosphere-lower troposphere), 150-25hPa (middle stratosphere), 25-3hPa (upper stratosphere) which help to distinguish the chemical and dynamical contributions to the O3 total columns variations. The ozone time development estimation ("trends") is also quantified based on the six years of the IASI observations in the four selected layers. The results suggest interestingly a significant positive trend in the upper stratosphere possibly pointing out arecovery of upper stratospheric ozone while a significant negative trend is observed in the troposphere in the mid-latitudes of the N.H. during the summer, probably linked to decreased emissions of ozone precursors. The observed variability of O3 in both the stratosphere and the troposphere is compared to simulations from the MOZART-4 global 3-D chemical transport model to help in the interpretation of the observations and, more particularly, for quantifying the influence of the stratosphere in the tropospheric ozone trends.

P6.7 - DEVELOPMENT OF A COMMUNITY HISTORICAL EMISSION INVENTORY: FIRST STEPS

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In recent multi-model comparison efforts that simulate the past, current and future composition of the global atmosphere, including the IGAC-SPARC Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP) and the Chemistry-Climate Model Initiative(CCMI) project, the models' ability to reproduce observed trends depends strongly on the specific surface emissions used. More such modeling exercises are planned during the coming years, either to forecast atmospheric composition at the regional and global scale or to quantify changes in atmospheric composition during past decades.

To support these modeling efforts, the global emissions community, led by GEIA, has launched a new initiative to develop a comprehensive community historical inventory for the1750-2015 period. The inventory will provide annual and sectoral anthropogenic and biomass burning emissions for ozone precursors, aerosols and their precursors, greenhouse gases and halogenated compounds. The emissions will be provided at a spatial resolution of 0.1-0.5°.

A workshop was held in November2013 in Hamburg, Germany, to define the process to develop this new dataset. 35scientists from Europe, North America, Africa and Asia participated in the workshop (www.geiacenter.org/analysis/working-groups/historic-emissions-working-group). The workshop focused on anthropogenic and biomass burning emissions; natural emissions will be addressed in another workshop. We will summarize the discussions which took place at the workshop, which concerned the improvement of historic and anthropogenic emissions. This meeting will be followed by discussions and a first analysis of the results during the GEIA (Global Emissions InitiAtive) conference in June 2014.

We will discuss how the IGAC community could participate in this initiative, in particular through a participation in working groups which are being formed to work on priority issues identified during the meeting.

P6.8 - STRATOSPHERIC OZONE TRENDS DERIVED FROM OVER THIRTY YEARS OF OSIRIS AND SAGE II DATA

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The Canadian built OSIRIS instrument onboard the Odin satellite has been in operation since the autumn of 2001. Since the beginning it has measured spectrally dispersed limb scattered sunlight in the wavelength range from 280 nm to 810 nm with approximately 1 nm resolution. These measurements have been used to derive a global time series of vertically resolved ozone profiles of high quality and with excellent spatial and temporal coverage. The SAGE II measurements of vertical ozone profiles are the standard for time series analysis but the record unfortunately ended in the middle of the last decade. As the OSIRIS time series agrees very well with the historical SAGE record during an overlap period in the early part of the last decade, and the OSIRIS data are still being collected, it is natural to extend the high quality SAGE II series with OSIRIS ozone measurements for further trends analysis. This paper discusses the technique used to merge the two data sets, the basis functions that are fit to the resulting anomaly time series and the derived underlying linear trends. We will show that since 1997 there exists a statistically significant increase in ozone throughout most of the stratosphere with increases primarily in between 3% and 8% per decade. We will also show that between 40 degrees South and 40 degrees North negative trends seen in the pre 1997 era still exist and that a statistically significant decrease in ozone exists at lower stratospheric altitudes in the equatorial region.

P6.9 - A GLOBAL SIMULATION OF BROWN CARBON: IMPLICATIONS FOR PHOTOCHEMISTRY AND DIRECT RADIATIVE FORCING

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Recentobservations suggest that a certain fraction of organic aerosol (OA) effectively-absorbs solar radiation and is coined as brown carbon aerosol. Very few modelingstudies have investigated the distribution and radiative effects of browncarbon aerosol yet. Here, we provide an explicit global simulation of browncarbon aerosol using the GEOS-Chem model, driven by the assimilatedmeteorological data. We first estimate global emissions of brown carbon frombiofuel use and biomass burning using emission factors depending on burningefficiencies from the literature. We also include secondary organic aerosols(SOAs) produced by the oxidation of aromatic species as brown carbon in ourmodel based on the chamber studies. We evaluate the model by comparing within-situ observations in the surface air in the U.S. and with single scatteringalbedo observations at AERONET sites over the globe. The model successfullyreproduces the observed seasonal variations but appears to underestimate themagnitudes especially in the regions where SOAs concentrations are high. Ourglobal simulations show that brown carbon accounts for about 20% of total OAs,which are typically assumed to be scattering aerosols. Consideration of solarabsorption by brown carbon in the model reduces the negative direct radiativeforcing of total OAs by 20%. Moreover, this absorption decreases NO-2photolysis rates especially in Asia up to 18%, and results in decreases ofsurface ozone concentration up to -9%.

P6.10 - GAS FLARING EMISSION IN AFRICA AND COMPARISON WITH CURRENT INVENTORIES

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Gas flaring is gas burnt as unusablewaste gas released during oil and gas extraction. The quantification of gasflaring emissions represents a major scientific concern due to its magnitudeand related uncertainties. In global/regional emission inventories, this source,though releasing large amounts of pollutants in the atmosphere, is still poorlyquantified if not missing. It can represent the main emission source of gaseouscompounds and particles in some areas, as observed during the AMMA project in theGulf of Guinea. Our study focuses on Africa, and includes Nigeria, which is thesecond largest natural oil (and gas) reserve in the world. Africa is animportant gas flaring area, since technologies for the exploitation of this energysource and the reduction of flaring activities have been only recently developed.We have developed an emission inventory for gases and particles from flaring inAfrica. We have first compiled the few published available dataset of fuelconsumption from flaring. The spatial distribution of CO2 and blackcarbon (BC) emissions from gas flaring in 2011 is estimated using a new methodologybased on field reports and remote sensing (DMSP satellite data). Our results pointout to the importance of flaring activities into the regional anthropogenicemissions in Africa over the period 1960-2011.

P6.11 - BIOMASS BURNING REGIONAL HAZE IN BRAZIL: AIRCRAFT OBSERVATIONS DURING SAMBBA

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Aerosols associated with large scale biomass burning (BB) impact upon weather, climate,human health and ecosystems at global and regional scales. However, quantitative evaluation of these effects is impeded by a limited understanding of BB processes and a dearth of direct measurements of aerosol properties. These result in large model uncertainties, especially over data poor regions such as Brazil, where intense burning is widespread throughout the dry season. Thus, the South American Biomass Burning Analysis (SAMBBA) field experiment of 2012 was timely, offering the chance to reduce these uncertainties and thus improve predicative capabilities in a changing climate.

Here we focus on regional haze, a complex and inhomogeneous accumulation of aged BB aerosols capped within the boundary layer, across swathes of South America. We utilize measurements from the suite of in-situ instrumentation on board the UK Facility for Airborne Atmospheric Measurement (FAMM) BAe-146 research aircraft. Flights were undertaken from a base in Porto Velho, Brazil, throughout September/October 2012.

As context for these measurements Aerosol Optical Depth (AOD) retrievals from MODIS and AERONET are presented. During the early flights an expansive, homogenous area of elevated (>1) AOD was present, however in transitioning toward the wet season, wet removal and advection due to frontal activity acted to reduce the spatial extent and magnitude of aerosol.

Aerosol concentrations measured on board the FAAM aircraft decreased concurrently with this meteorological forcing, however the relative atmospheric structure, composition and optical properties remained similar. For instance the ratio of OA:BC throughout the atmospheric column was maintained at~10:1, whilst a maxima of aerosol concentrations at ~1km persisted in vertical profiles.

Significant differences were, though, observed in optical properties, between the western (Rondônia)and eastern (Tocantins) regions. The single scattering albedo was 0.91 and 0.84 respectively, due to observed differences in combustion phase, a function of land use and burn practice. In the eastern Amazon this represents a lesser negative direct radiative forcing.

This work presents a synthesis of the state of the South American atmosphere under the influence of haze, as measured in-situ by a research aircraft during a range of meteorological conditions and burn types.

P6.12 - STUDY OF THE HYGROSCOPICITY OF THE ATMOSPHERIC AEROSOLS BY MEANS OF TWO NEPHELOMETERS DURING THE WINTER SEASON IN MADRID

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Atmospheric aerosol particlesundergo hygroscopic growth at high relative humidity (RH). As a consequence,their microphysical and optical properties are strongly conditioned by RH. The aerosol scattering enhancement (f(RH)), defined as the ratio of the aerosol scattering coefficient at wet over dry conditions, is one of the key parameters needed for evaluating short-wave aerosol radiative climate forcing (McInnes et al., 1998).

Recent studies show the relevance of using two nephelometers to study the aerosol hygroscopic properties (Pilinis etal., 2014). Comparable f(RH) and aerosol volume growth factor (VGF) were obtained using respectively data from the nephelometers measuring at dry and ambient conditions and a DAASS (Dry Ambient Aerosol Size Spectrometer).

This study focuses on the study ofthe f(RH) at a wavelength of 525 nm during the winter period in Madrid, using the data obtained at very dry conditions (RH = 15%) and ambient RH by means of two Nephelometers (Aurora 1000 and Aurora 3000 respectively, Ecotech Pty Ltd., Australia).

In order to assess the relation between the aerosol hygroscopic growth and its chemical composition, an ACSM (Aerosol Chemical Speciation Monitor) and an Aethalometer were used. The ACSM (Aerodyne Research Inc., MA, USA) monitored the volatile fraction of the particulate matter in PM1 (nitrate, sulphate, ammonia and organics), while the Aethalometer (Magee Sci. mod. AE33, Aerosol d.o.o., Slovenia) was used to estimate the PM1 concentrations of black carbon (BC) (light absorbing particulate matter at 880 nm of wavelength, with a mass absorption cross-section of 7.77 m2/g).

Preliminary results showed a moderate f(RH), even during periods of high concentrations of inorganic compounds, typical from polluted areas. Aerosol hygroscopicity was inversely related to the BC concentrations, showing its maximum during periods of high concentrations of inorganic compounds or inorganic-organic mixtures.

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References
McInnes, L., et al., 1998. Geophys. Res. Lett., 25, 513-516.
Pilinis C., et al., 2014. Atmos.Environ., 82, 144-153.

P6.13 - STRUCTURAL PROPERTIES OF THE PARTICLES EMITTED ON THE COMBUSTION OF BIOWASTE FUEL IN A BUBBLING FLUIDIZED BED REACTOR

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The demand of bioenergy production linked to industrial heat and power production is constantly increasing. This growth undoubtedly implies a notable increment on the volume of industrial wastes that need to be properly quantified and characterized to design the adequate abatement strategies in terms of environmental mitigation purposes and health related studies. Fluidized bed combustors (FBC) have been identified as one of the most advantageous technologies for converting biomass into energy. However, the characteristics and rate of the emissions during this type of combustion processes is still uncertain.

In this study, particulate emissions (fly-ashes) from two different combustion experiences carried out in a pilot-scale bubbling fluidized bed combustor (BFBC) have been characterized by means of electron microscopy. The study includes detailed information on the structural properties -such as size, morphology and elemental composition- of the individual particles from the combustion of residues from the cellulose industry. These combustion experiences included: i) the co-combustion of forest biomass residues with sewage sludge in a bed operated with silica sand and ii) the combustion of forest biomass residues using as bed material a bottom bed treated and recycled from an industrial bubbling fluidized bed using forest biomass residues as fuel

For both experiences, an important fraction of particulate matter emitted was constituted by calcium enriched mineral particles. The calcium carbonate and oxide particles had a maximum peak on the size distributions between 1 and 2.5 um and two main morphologies: the typical crystallization from these groups that give aspect ratios (AR = Dmax/Dmin) from around 1.6 to 1.8, and fibres of AR > 5. Other interesting groups were the potassium enriched salts with submicrometric to nanometer sizes and typically cubic to rounded morphologies (AR < 1.6), rest of biogenic residues fitting very different fancy morphologies (and variable associated AR valued) and soot aggregates.

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P6.14 - BIOGAS PRODUCTION BY ANAEROBIC DIGESTION PROCESS USING FOOD WASTE AND SEWAGE FROM RESTAURANTS AND ITS CONTRIBUTE TO MITIGATE THE GREENHOUSE EFFECT

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Many studies have been performed focusing thedevelopment of new alternatives of feasible and safe treatments for thedisposal of municipal food waste due to the severe environmental problemscaused by its inadequate disposal, mainly in large urban centers. Chemical andphysical processes contribute to food decomposition, but the main process isbiological landfill gas production is a biological process, in which carbondioxide (CO2), methane (CH4), and other trace gases areformed by the action of microorganisms on organic wastes1. The mainobjective of this study was to investigate the production of biogas by theanaerobic digestion process using food waste and sewage. Biogas productionthrough anaerobic digestion is a good alternative for food waste processing and one of the goals ofthis work is to verify the efficiency when adding the sewage in this process. It can produce a biogas with 60-70% of methane,adequate for combustion, thermal and electric energy generation2.The application of this technology for food waste management, before itsdisposal, can contribute to mitigate the Greenhouse Effect, generating energy frommethane gas that naturally would be released in the atmosphere, and is in linewith the national solid waste policy. The characterization of the mixture (Foodwaste + Sewage + Sludge) was performed by laboratorial tests which includedKjedahl Nitrogen, pH, Phosphorous, Total Organic Carbon, Fatty Acids and Oils.These parameters were measured during digestion. In addition, the biogasproduced was also characterized. The material used was collected in therestaurant. The meals are basically composed by the same food groups everyday:rice (amide), beans, meat, vegetables and a dessert that sometimes is fruit andsometimes is sweetmeats. All the samples prepared for inoculum and analysiswere stored at -10ºC. The biogas was collected in Tedlar bags and stored at-10ºC until CG analysis. The determination of methane and carbon dioxide gaswas performed on a Varian CP-4900 Portable Micro Gas Chromatograph, with TCDdetector.

P6.15 - EVALUATIONS AND PROJECTIONS OF STRATOSPHERIC OZONE FROM ACCMIP, 1850-2100

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We will present an analysis and evaluation of stratospheric ozone from 1850 to 2100 from the models that took part in the Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP), a project that was designed to evaluate the long-term atmospheric composition changes and their related climate impacts. Within uncertainty, the ozone depletion between 1980 and 2000 for the multi-model mean agrees with the observational estimate from the Total Ozone Mapping Spectrometer (TOMS), as well as with the Bodeker Scientific (BDBP) and the CCMVal-SPARC datasets. However, many individual models lie outside the observational estimate. The total column ozone in 1850 for the austral spring (SON) and Southern Hemisphere (SH) high latitudes (> 65°S) in the ACCMIP ensemble is ~50 % higher than present-day (2000) values. Future model projections were performed following the four Representative Concentration Pathways (RCPs). The multi-model ensemble mean total column ozone for SON and SH high latitudes increases by 18.7 % for RCP2.6, 21.2 % for RCP4.5, 26.9 % for RCP6.0, and 17.9 % for RCP8.5 in 2030 compared to the present-day, and by 44.8-48.2% by 2100. Finally, for the large SH ozone changes during austral spring (SON, >65°S), there is a significant relationship (r = 0.75-0.80; $p < 0.05$) between the simulated stratospheric and tropospheric ozone columns, as suggested in previous studies.

P6.16 - SEASONAL AND DIURNAL BEHAVIOR OF PARTICLE NUMBER SIZE DISTRIBUTION IN THE CENTRAL ANDES LOWER FREE TROPOSPHERE AT MOUNTAIN CHACALTAYA (5240 MASL).

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In order to study the seasonal and diurnal behavior of aerosols in the Central Andes free troposphere, particle number size distributions in the range from 10 to 500 nm were measured at the highest altitude GAW station, using a mobility particle size spectrometer from 2012 to 2013. Based on meteorological conditions,we divided the data set into the wet and dry seasons. Furthermore, the dry season was subdivided in dry with biomass burning (DWBB) and dry without biomass burning (DOBB). The analysis shows that the particle number size distribution changes during the year exhibiting a strong intra-seasonal variability, which seems to be related to both natural and anthropogenic activities. In general, the number concentration at any size is larger during dry season than during the rainy season. In addition, the results show that particle number size distribution varies as a function of the season. For instance, the concentration of nucleation mode is higher during DOBB than during the DWBB. On the contrary, Aitken and Accumulation modes concentrations are higher during DWBB than during DOBB. The evolution of the planetary boundary layer (PBL) over the course of the day has a clear influence on the particle number size distribution leading to elevate concentrations during daytime at the mountain site. The data suggests that the station is above the PBL at night time, which permits studying the background conditions of the free troposphere and its seasonal variation.

P6.17 - POLLUTION IMPACT ON SNOW IN THE CORDILLERA-EXPERIMENTS AND SIMULATIONS (PISCES)

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Photographs and satellite images haveclearly documented the receding glaciers and snowpack in the Andes. Theunderlying causes driving the acceleration of the loss of the snow and ice -thecryosphere- are not clear, since both natural climate cycles and/or humanactivities can contribute. There is, however, indisputable evidence in otherregions of the world that black carbon (BC) can significantly affect glaciersand snow pack, by changing the albedo and also by enhancing localized melting. There is a paucity of measurements in theAndes that can conclusively link anthropogenic activities, e.g. BC emissions,to the diminishing cryosphere. There are few measurements of those aerosolproperties relevant to surface albedo changes and to precipitation processes, i.e.their op-

tical and hygroscopic properties. Of interest for understanding thetrends in the Andean cryosphere extent are 1) the temporal and spatial distributionof the meteorological properties of the atmosphere, 2) solar and terrestrialradiative fluxes, 3) trace gas concentrations and 4) aerosol particle concentrationsand properties in the region. As the first step towards a betterunderstanding of the impact of urban pollution on the Andes cryosphere, a pilotproject, "Pollution Impact on Snow in the Cordillera-Experiments and Simulations (PISCES) was conducted in July and August,2014. This project is part of the PISAC initiative (mce2.org/en/activities/pisacsouth-american-cryosphere). The field campaign phase of PISCESconsisted of three sets of measurements: 1) on the eastern edge of the city ofSantiago, Chile, 2) at a ski area to the east northeast of Santiago, at 3000mand very little local traffic and 3) at a ski area to the northeast ofSantiago, at 3000m and near a major highway. Aerosol measurements were made ofconcentrations of CN, CCN, EBC, PPAH and the coefficients of scattering andabsorption, Bscat and Babs. Trace gas measurements were made of CO, CO2,SO2, O3 and NOx. Regional, high-resolution simulations will becarried out for selected case studies to evaluate the processes responsible forthe transport and deposition of the pollutants over the snowpack and glaciers. This presentation will show preliminaryresults that compare the observations from the three sites and link theparticles and gases found at the ski areas to local and urban emissions.

P6.18 - PERSPECTIVES ON AIR QUALITY AND CLIMATE CHANGE ABATEMENT IN THE LIGHT OF IPCC 2013.

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The recent IPCC report, 2013, has givena estimates of the total anthropogenic aerosol forcing lower compared to theformer report (2007) with about 0.5 W/m2. However the estimate ofthe uncertainty in the total aerosol forcing estimate has not changed and stillhas a considerable range.

The implications of the relative smallchange between the two reports is however quite considerable. It will quite significantlydecrease differences in global climate effects between different air quality abatementstrategies. Further it implies a significant lower climate sensitivity giving asmaller absolute temperature response to changes in anthropogenic aerosolconcentrations.

As a consequence of air qualityabatement emissions of anthropogenic aerosols and precursors have already beenreduced in large parts of the world, e.g. Europe and North America. Butemissions have increased in the rapid developing countries e.g. in Asia, wheremany major cities encounter severe air quality problems. IPCC (2013) assume airquality abatement in the developing countries will decrease emission such thatglobal emissions of air pollutants will decrease with about 30 - 50% within thenext 30-50 years in all their emission projections with one exception, ozonewill increase due to strongly increasing methane emission in RCP8.5. Methane isa key component in abatement of tropospheric ozone. Thus the total aerosolforcing will decrease similarly.

The CO2 concentration willcontinue to increase and when reaching the double natural backgroundconcentrations its forcing will have more the doubled compared to present CO2forcing making it the totally dominating forcing component.

The regional effect of anthropogenicaerosol forcing is still not well know even though there are evidence ofconsiderable effects on both local and regional scale, e.g. in the Arctic.

The main implication from the discussion is thatair pollution abatement should be pursued from mainly air quality perspective,decreasing effects on ecosystems, food production and human health. While CO2dominate the climate change and should be the focus of the climate changeabatement. However there is one exception, ozone is both an important climateand air pollution component that should be effectively abated throughdecreasing all ozone precursors, including methane.

P6.19 - OBSERVABILITY OF TROPOSPHERIC PHOTOCHEMICAL PROCESSES FOR EARTH OBSERVATION

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Earth observationactivities, like the European Copernicus initiative, comprise aims to monitorchemistry processes in the atmosphere by building up a fleet of space bornesensors and ground based in situ observation networks. However measured chemical compounds are mostly confinedto O3, CO, NO2, and SO2 for the gas phase, with little, if any, verticalresolution by nadir viewing sensors in the troposphere. Operational difficulties in aerosolidentification result from integrated information by PMx from in situ instrumentation, and aerosol opticaldepth from remote sensing devices. The ability to identify and quantify observationalgaps in the global observing system,impeding to find signals of change andthe quantification of climate forcing processes, mostly emissions is theredecisive.

In its first part, thepaper presents a critical appraisal of today’s and future space borne sensorsto identify and quantify climate sensitive chemical processes in the troposphere withfocus on photochemistry and aerosol formation. The process- wise view, ratherthan individual species, serves to identify observability gaps in themeasurement network, making use of kinetic dependencies.

In the 2nd part, asproof of concept will be presented, based on the chemical 4-dimensionalvariational data assimilation technique with the photochemical processes ofozone and PAN production as an example case. The case of observability is addressed by the concept of targeted observationsfrom meteorology, novel in atmospheric chemistry. The method demonstrates itsability to exhibit the time dependent dynamic interaction between NOx and volatile organic compounds (VOC) inconstraining ozone formation. It is shown not only to apply for certainscenarios, but also changing with evolving time, day time and oxidation status.

An application to aZeppelin airship measurement campaign cruising the southern German boundarylayer is added, demonstrating the ability of the system to identify therelative values of VOC, CO and NO2 observations for ozone formation.

P6.20 - THE CURRENT STATUS AND FUTURE OF THE DATA AND METADATA MANAGEMENT IN WMO GAW WORLD DATA CENTRE FOR GREENHOUSE GASES

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World Data Centre for Greenhouse Gases (WDCGG) is one of the six data centres under World Meteorological Organization (WMO) Global Atmosphere Watch (GAW) programme. From its establishment in 1990 supported by Japan Meteorological Agency

(JMA), the WDCGG has served to accept, archive and distribute in situ and partly remote-sensed long-term measurement data for greenhouse gases (CO2, CH4, CFCs, N2O, tropospheric ozone, etc.) and reactive gases (CO, NOx, SO2, VOCs, etc.) mainly in the atmosphere. From 2006, WDCGG has been contributing to the global analysis of major greenhouse gases in the WMO Greenhouse Gas Bulletin (https://www.wmo.int/pages/prog/arep/gaw/ghg/GHGbulletin.html).

Due partly to the increase of atmospheric chemistry model users who tend to use more raw measurement data, the role of WDCGG has been increasing recently in greenhouse and reactive gas measurement and application community. A hit number with the word “WDCGG” on Google Scholar has reached over one thousand by March 2014. However, with the circumstance of increasing gas species, categories and amounts of data submissions and recent very fast advancements in cyber infrastructure, fundamental reform of WDCGG meta- database and connected web service is imperative to meet the demands from data contributors and users.

In this poster, the plan and progress of the ongoing WDCGG renewal are presented.

- Simple user registration and feedback information on downloads to the contributor,
- Feedback information to support quality control at laboratories,
- Simple and consolidated new file formats,
- Enhanced compatibility and interoperability with other science programmes based on standard profiles, e.g., ISO19115),
- Bulk submission via regional data centers,
- Accessible instructions for contributors and users
- Streamlined but enhanced metadata items and user support information,
- Reasonable meta- database structure and data categories (platforms, measurement strategies, instruments,...)
- Simple and consolidated data format,
- Vocabularies (nomenclature),
- Improved Discovery Access and Retrieve (DAR) catalogue and function.

The authors are planning to release the first proto-type of the fully redesigned meta- database and web service within one year. Any constructive criticism and suggestions for utilizing WDCGG as a science community resource for all contributors and users would be highly appreciated.

P6.21 - THE RETROSPECTIVE APPLICATION OF GAW MEASUREMENT GUIDELINES TO EXISTING LONG TERM SURFACE OZONE RECORDS: A CASE STUDY AT CAPE GRIM, AUSTRALIA

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Quantifying and understanding changes in tropospheric and near-surface ozone, and the environmental consequences of such changes, are a priority task within the WMO Global Atmosphere Watch (GAW) Programme. To this end GAW has recently updated its guidelines for the continuous measurement of ozone in the troposphere (Galbally and Schultz 2013). A major objective of these guidelines is “To ensure that tropospheric ozone measurements made by different laboratories are compatible and meet common data quality objectives suitable for the detection of regional and global changes.”

The most valuable records of tropospheric ozone are those that extend back 30 to 40 years, providing a window on how tropospheric composition may have changed over this time. These long term tropospheric ozone records include measurements that were made before the existence of the GAW measurement guidelines, the first of which were prepared in 1994. The question then arises: how, in retrospect, are these older measurements brought into a quality control framework with quantified uncertainties that are in line with the current GAW measurement guidelines and modern scientific requirements. Here is presented a retrospective application of these guidelines to the Cape Grim surface ozone record for the period 1976 – 2013. For the period 1982 – 2013, , key issues that arose in the analysis and the tools developed to address them are presented, along with quantified measurement uncertainties for the observation period.

P6.22 - THE IMPACT OF CLIMATE CHANGE AT MEDIUM AND HIGH RESOLUTION ON ATMOSPHERIC COMPOSITION

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The impact of climate change on atmospheric chemistry at the regional and local scale is examined using a nested model framework. CMIP5 global climate simulations from the HadGEM2-ES model are down scaled to 50 km (over Europe) and 5 km (over the UK) resolution with the Weather Research and Forecasting (WRF) model. The high resolution meteorology is then used to drive chemical simulations with the EMEP and EMEP4UK models over the same domains. Under the RCP8.5 climate scenario, mean summer temperatures over large regions of the UK increase by more than 6 K between the present day and the 2090s, with peak local temperatures increasing by more than 10 K. We examine the response of ozone, PM2.5, PM10 and the individual PM components to this simulated climate change at both the 50 km and 5 km resolution. The impacts on UK air composition arising from changes in the regional background composition and in atmospheric transport are distinguished from those due to changes in local chemistry. We consider the role of biogenic isoprene emissions in future climate and the implications of a reduced peroxyacetyl nitrate (PAN) lifetime for the export of ozone and its precursors from regions of high NOx emission. The effect of temperature and humidity changes on aerosol phase partitioning and hence on the frequency and severity of high PM episodes over the UK is also investigated. Simulations using 2090s meteorology with present-day emissions of the short lived anthropogenic gases help quantify the relative impacts of the projected changes in climate and in precursor emissions on future atmospheric composition.

P6.23 - THE SOUTHERN HEMISPHERE ADDITIONAL OZONESONDES (SHADOZ) ARCHIVE

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The Southern Hemisphere Additional Ozonesondes(SHADOZ) is an archive to augment and archive balloon-borne ozonesonde launchesfrom tropical and subtropical operational and campaign sites. The project wasinitiated in 1998 by NASA/Goddard Space Flight

Center in partnership with NOAA andinternational co-investigators from more than 15 countries. SHADOZ wasinitially designed to remedy the lack of ozone profile data in the tropicalstratosphere & troposphere to validate satellite tropospheric ozoneestimates and provide a database for process studies and model validation.Since its inception SHADOZ has also served as an educational resource forstudents, especially in the participating countries. In recent years, thearchive has expanded to include ozone and radiosonde (P-T-U) profiles from northerntropical stations. As a flexible archive, SHADOZ has grown and evolved asscientific needs and research questions change. Data are collected twice/monthor weekly at each station and made available publicly at the SHADOZ official website:http://croc.gsfc.nasa.gov/shadoz. BecauseSHADOZ works in collaboration with WMO/GAW and NDACC activities for ozonesondeoperational standardization, data in the SHADOZ archive are re-processed fromtime to time. We present anoverview of SHADOZ usage and citation statistics. In addition, recent updatesto the SHADOZ archive will be presented in a status report.

P6.24 - COMPARISON OF TROPICAL OZONE FROM SHADOZ WITH REMOTE SENSING RETRIEVALS FROM SUOMI-NPP OZONE MAPPING PROFILE SUITE (OMPS)

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The Ozone Mapping Profile Suite (OMPS) was launched October28, 2011 on-board the Suomi NPP satellite. OMPS is the next generation totalcolumn ozone mapping instrument whose main purpose is to monitor globaldistribution of ozone in the stratosphere. OMPS includes a limb profiler tomeasure the vertical structure of stratosphere ozone down to 15 km. This study uses tropical ozonesondeprofile measurements from the Southern Hemisphere Additional Ozonesondes(SHADOZ) archive to evaluate total column ozone retrievals from OMPS andconcurrent measurements from the Aura Ozone Monitoring Instrument (OMI): thepredecessor of OMPS with a data record going back to 2004. We include ten SHADOZ stations thatcontain data overlapping the OMPS time period. This study capitalizes on the ozone profile measurementsfrom SHADOZ to evaluate OMPS limb profile retrievals in the lower stratosphere(15~25 km). Finally, we use OMPSretrievals to examine the variability and accuracy of the GEOS-5 OzoneAssimilation System (GOAS). The GOAS uses data from the OMI and the MicrowaveLimb Sounder (MLS) to constrain the total column and stratospheric profiles ofozone. The improved system is used in a multi-year analysis with 2° x 2.5°latitude-longitude resolution and about 1 km vertical resolution in theUTLS. The most recent version ofthe assimilation system is well constrained to the total column compared withSHADOZ ozonesonde data. In this presentation, we examine the variability andaccuracy of the model simulation of ozone relative to ozonesonde data and OMPS.

P6.25 - THE ASIAN SUMMER MONSOON AND ATMOSPHERIC COMPOSITION INITIATIVE (ACAMI): A JOINTLY SPONSORED IGAC/SPARC ACTIVITY

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As a weather pattern, the Asian monsoon impacts the lives of more than a billion people. Regions affected by the monsoon have experienced rapid population and economic growth in the recent decade; thus, the coupling between the monsoon convection and changing surface emissions is of broad interest to the Atmospheric Composition community. This interest extends to possible feedbacks on the monsoon circulation through enhanced aerosol–cloud interactions. Satellites have further demonstrated the effectiveness of the monsoon circulation for transporting pollutants to the stratosphere. The monsoon system is therefore relevant to scales and processes bridging regional air quality,climate change, and global chemistry-climate interaction. Accurate representation of this system in global chemistry-climate models is critical to predicting how this evolving region may contribute to future change. The ACAM initiative seeks to provide a forum for interested scientists to collaborate and organize their efforts to understand these impacts. An initial community workshop was convened in June 2013 in Kathmandu, Nepal. Based on outcomes from that meeting, the initiative is proceeding in four areas:

(1) Organizing data sharing for ACAM-relevant observations,(2) Form a partnership with CCMi to focus on the representation of ACAM impacts in global climate models, (3) Organize the ACAM community to development future field campaign concepts, (4) Develop training opportunities for young Asian scientists on the use of models and satellite observations.

The ACAM community has a goal of convening once every two years. Details for a 2015 workshop will be forthcoming and available at the time of this presentation.

P6.26 - GLOBAL CARBON MONOXIDE CHANGES MEASURED BY THE MOPITT INSTRUMENT.

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On 18th December 1999 the Terra platform was launched carrying the Measurements Of Pollution In The Troposphere (MOPITT) instrument. MOPITT has now completed over fourteen years of operation measuring carbon monoxide (CO) over the planet. MOPITT was designed with a 5-year mission in mind and with delays in the launch, the instrument was already several years old when it went into space. However, it has just kept going and going and the instrument performance and stability have been exceptional. A recent review suggested that at current rates of deterioration the instrument could last another decade at least. MOPITT was designed to examine the global distribution of carbon monoxide which has spatial variations of factors of 2x or more. Over the course of the mission many events in the carbon monoxide field have been observed including outflow from fires and industrial activity, meteorological events occasioned by the juxtaposition of airmasses, long-range transport of pollution up to the planetary scale and long term trends in carbon monoxide on the regional and global scale. This talk will cover some of the more recent work that has been enabled by the extreme length of the dataset which continues to be longest continuous global record for CO available. MOPITT was provided to the Terra spacecraft by the Canadian Space Agency and was built by COMDEV of Cambridge, Ontario. Data processing is performed by the MOPITT team at the National Center for Atmospheric Research, Boulder, CO. Instrument control is by the team at the University of Toronto.

P6.27 - OZONE PROFILE CHANGES AND MONTREAL PROTOCOL

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Stratosphericconcentrations of ozone depleting substances (ODSs) in mid-latitudes haveslowly decreased since mid-1990s due to the successful implementation of theMontreal Protocol (1987) and the subsequent enforcements. Comprehensiveanalysis of profile ozone changes is vital to documenting the beneficial effectof the Montreal Protocol on the ozone layer, particularly since ozone recoveryis expected to first become visible in the upper stratosphere where ODSs arephotolysed and affect ozone most strongly. The global picture needs to be basedon merged satellite ozone series since no satellite instrument covers theentire period from when ODSs started affecting stratospheric ozone in the 1970suntil the present.

Sevenmerged satellite series were analysed by applying a multiple regression modeldescribing the annual cycle, and including proxies for the QBO (Quasi-BiennialOscillation), solar cycle, ENSO, and volcanic aerosols. For the period1979-1990 (downward ozone trends) a consistent picture was found showinglargest trends in the mid-latitudes in the upper stratosphere. For therecovery, the period 1998-2012 was analysed, where trends are somewhat lessconclusive. Possible reasons for these differences will be discussed in thepresentation, e.g. by comparing the interannual variability among the mergeddata series'.

The workpresented here results from the SI2N activity, which is an internationalinitiative supported by SPARC, the International Ozone Commission (IO3),IGACOO3/UV of GAW (Global Atmosphere Watch), and NDACC (Network for theDetection of Atmospheric Composition Changes) demonstrating the bottom-upcharacter of the project. The results will provide important information forvalidation of numerical model simulations.

P6.28 - EXTREME OZONE EPISODES IN SURFACE OBSERVATIONS AND GLOBAL MODELS

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We identify and characterize extreme ozone pollution episodes over the USA and EU through a novel analysis of ten years (2000-2010) of surface ozone measurements. An optimal interpolation scheme is developed to create grid-cell averaged values of surface ozone that can be compared with gridded model simulations. In addition, it also allows a comparison of two non-coincident observational networks in the EU. The scheme incorporates techniques borrowed from inverse distance weighting and Kriging. It uses all representative observational site data while still recognizing the heterogeneity of surface ozone. Individual, grid-cell level events are identified as an exceedance of historical percentile (100 worst days in a decade, 97.3 percentile). A clustering algorithm is then used to construct the ozone episodes from the individual events. We then test the skill of the high-resolution (100 km) two-year (2005-2006) hindcast from the UCI global chemistry transport model in reproducing the events/episodes identified in the observations using the same identification criteria. Although the UCI CTM has substantial biases in surface ozone, we find that it has considerable skill in reproducing both individual grid-cell level extreme events and their connectedness in space and time with an overall skill of 24% (32%) for the US (EU). The grid-cell level extreme ozone events in both the observations and UCI CTM are found to occur mostly (~75%) in coherent, multi-day, connected episodes covering areas greater than 1000 x 1000 square km. In addition the

UCI CTM has greater skill in reproducing these larger episodes. We conclude that even at relatively coarse resolution, global chemistry-climate models can be used to project major synoptic pollution episodes driven by large-scale climate and chemistry changes even with their known biases.

P6.29 - GAW DATA MANAGEMENT IN SUPPORT OF ATMOSPHERIC CHEMISTRY AND GLOBAL POLLUTION RESEARCH: PAST, PRESENT AND FUTURE

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The World Meteorological Organization (WMO) Global Atmosphere Watch (GAW) is the WMO program addressing the observation of the chemical composition and selected physical properties of the atmosphere. Since the 1960s, GAW World Data Centres (WDCs) have been established. The main task of the WDCs (and some related data centres) is to collect, archive and distribute atmospheric observation data. Since 2001, the GAW Station Information System (GAWSIS) has documented GAW observing networks and provided information on available data. GAW data comprise of long-term time series of ozone, greenhouse and reactive gases, aerosols, radiation, and precipitation chemistry from in-situ and remote-sensing observations. The presentation will give an overview of the holdings of the WDCs and discuss the procedures used in accepting and distributing these data.

Today, GAW data management operates under the guidance of the Task Team on GAW WDCs (ET-WDC). Six WDCs operate independently with national funding, but coordinate their work and the exchange with GAWSIS through ET-WDC. Aside from the challenges of maintaining and constantly improving the services of the WDCs, a huge challenge is interoperability. At present, metadata from the WDCs and a few regional or topical data archives are exchanged with GAWSIS through agreed, but non-standard flat files, or periodically collected manually by GAWSIS. ET-WDC has developed a profile of the ISO19115 metadata standard that is intended to improve interoperability and harmonize the documentation of observations between WDCs.

In future, as projects for renewal of the WDCs as well as GAWSIS are being realized, and as more data archives are expected to join, standard web services will replace these ad-hoc arrangements, paving the way for the development of a truly interoperable system in support of the GAW objectives – a system supported by a comprehensive catalogue and nourished by distributed data archives, where data are easily discoverable and accessible in a variety of formats for a variety of applications including atmospheric chemistry and global pollution research … a system where ground-based and satellite observations, as well as model results, are only clicks away from each other in the same portal for being combined and jointly interpreted.

P6.30 - THIRTY YEARS OF OZONE OBSERVATIONS IN NAIROBI, KENYA

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The GAW Regional Station Nairobi operates in support of the SHADOZ: Southern Hemisphere ADditional OZonesondes program coordinated by Anne Thompson at NASA.

The presentation will discuss the history of the station, the long-term monitoring results and trends observed, compare Dobson and ozone soundings, and explore the contributions of the station to tropical ozone observations.

P6.31 - CLIMATE IMPACTS OF CONTROLLING SHORT-LIVED AIR POLLUTANTS IN CHINA

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China is amajor emitter of harmful air pollutants, and informed policy planning demands a comprehensive understanding of the expected responses to implementation of pollution control technologies in a changing climate. However, predicting the air quality and near-term climate responses to changing air pollution emissions is met with complicating factors: the photochemistry leading to tropospheric ozone production is non-linear; concurrent climate-driven changes in natural emissions of reactive carbon compounds, such as isoprene, can impact the oxidation capacity of the atmosphere; and the short-lived air pollutants, many of which share common emission sources, variously lead to warming and cooling. Here, we present a global modeling study aimed at quantifying the near-term climate and air quality impacts of controlling emissions of short-lived climate pollutants from China. In the first phase of the project, we develop future emission scenarios using IIASA's Greenhouse Gas – Air Pollution Interactions and Synergies (GAINS) integrated assessment model. Using estimates of 2030 emissions based on current policies for energy and emission control, we identify high-impact measures to mitigate short-lived climate pollution in China. We rank the pollution control measures based on their climate impact and find that the choice of climate metric makes little difference in the identification of priority mitigation measures: methane emission reductions account for more than three quarters of possible CO2-equivalent reductions of the short-lived climate pollutants and their precursors, and controlling methane emissions from coal mining is the single highest-priority measure. Then, in the second phase of the project, we apply the future priority emission scenario in the Yale-E2 global carbon-chemistry-climate model to assess the impacts of regional reductions of the short-lived climate pollutants and their precursors on radiative forcing by multiple agents and on surface PM2.5 and ozone air pollution. For the first time, the model simulations include fully dynamic methane and photosynthesis-dependent isoprene emissions. We exploit these advances to quantify the extent to which future changes in atmospheric oxidation capacity, driven by altered forest reactive carbon emissions in the future warmer, wetter world, will offset the competing impact of methane emission reductions.

P6.32 - ARCTIC AIR POLLUTION: NEW INSIGHTS FROM POLARCAT

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Given the rapid nature of climate change occurring inthe Arctic and the difficulty for climate models to quantitatively reproduceobserved changes, there is need to improve understanding about key processesincluding the role of short-lived climate pollutants such as aerosols andozone. Here, we* review highlights from the IGAC task POLARCAT (Polar Studyusing Aircraft, Remote Sensing, Surface Measurements and Models, Climate,Chemistry, Aerosols and Transport) which had the goal to improve our understanding about the origin of pollutants transported to the Arctic, todetail chemical and aerosol composition in different air masses as well as to evaluate the role of different sources (anthropogenic, boreal fires, etc.), andtheir impact on Arctic composition and climate. Analysis of data collected during the POLARCAT aircraft, ship and ground-based field campaigns in spring and summer 2008, provided a wealth of new data which, combined with regional/global modelling and analysis of satellite data, has led to many new findings about Arctic air pollution. In particular, new data was collected about the vertical distributions of trace gases and aerosols in the Arctic allowing new insights into pollutant origins and processing as well as assessment of chemistry-aerosol model performance. We highlight major findings and discuss areas requiring further investigation, including the potential growth in local sources of pollution as a result of climate change and economic development inthe Arctic.

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P6.33 - OBSERVATIONAL CONSTRAINTS ON OZONE RADIATIVE FORCING FROM THE ACCMIP PROJECT

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Tropospheric ozone is the third most important greenhouse gas within an estimated radiator forcing of 350 mW/m2 since preindustrial times according to the IPCC AR4. For the IPCC AR 5, the atmospheric chemistry climate model inter-comparison project (ACCMIP) provided new estimates of ozone radiative forcing using a suite of state-of-the-art chemistry climate models along with in situ and satellite observations. We use observations of tropospheric ozone and outgoing longwave radiation (OLR) from the NASA tropospheric emission spectrometer (TES) to evaluate ACCMIP simulations over the present-day. ACCMIP ozone biases lead to biases in OLR exceeding 100 mW/m2 in the tropics. We show that these biases can be related to ACCMIP ozone radio forcing. Based upon that relationship, an observational constraints is constructed that limits the range of plausible estimates of ozone RF.

P6.34 - INITIAL HIGHLIGHTS OF THE CONVECTIVE TRANSPORT OF ACTIVE SPECIES IN THE TROPICS (CONTRAST) EXPERIMENT

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Deep convection redistributes chemical trace gas species throughout the troposphere and strongly influences the chemical composition of air entering the stratosphere. Characterizing the impact of convective redistribution on chemical transport and transformation is a significant challenge for understanding chemistry-climate interaction in a changing climate. To investigate the impact of deep convection on chemical composition and ozone photochemical budget, the CONvective TRansport of Active Species in the Tropics (CONTRAST) Experiment was conducted from Guam (13.5° N, 144.8° E) using the NSF/NCAR Gulfstream V (GV) research aircraft during January and February 2014. The experiment was part of three coordinated experiments to target the tropical Western Pacific during Northern Hemisphere winter, when and where the most extensive deep convection in Earth's climate system develops. The partner missions were ATTREX (Airborne Tropical Tropopause Experiment), which deployed the high-altitude NASA Global Hawk, and CAST (Coordinated Airborne Studies in the Tropics), which used the UK FAAM BAe 146 research aircraft to investigate the lower to mid-troposphere of the Western Pacific. A total of 16 research flights were conducted using the GV, with measurement of ozone, CO, CH4, andCO2, as well as a large suite of chemical tracer measurements including organic and inorganic halogen species, NMHCs, and OVOCs. The research flights from Guam covered 20°S to 40°N latitude, 130°E to 165°E longitude, and 0.1 to 15.2 km ASL in altitude,successfully sampled the recent and aged outflows from active deep convective storms and defined the background chemical conditions of the tropical western Pacific during boreal winter. The results are expected to bring new insights into the ozone and halogen budgets of the tropical troposphere. These airborne observations, especially in combination with the CAST and ATTREX data,provide key measurements and diagnostics for evaluating and constraining chemistry-climate models. Highlights of the experiment and initial findings will be presented.

P6.35 - QUANTIFYING THE CHEMISTRY-CLIMATE FEEDBACK FROM LIGHTNING IN GISS MODELE2

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Climate change can affect atmospheric composition through perturbation of natural processes, leading to complex feedbacks. The primary atmospheric oxidants OH and ozone are very sensitive to emissions of nitrogen oxides (NOx) from lightning, and therefore so are the subsequent chemical perturbations to long-lived greenhouse gases (e.g., methane) and aerosol chemistry and physics. Meanwhile, cloud electrification responds to both meteorology and composition (aerosol particles). Lightning therefore represents a complex chemistry-climate feedback mechanism. However, the feedback has yet to be quantified for the coming century in a 3-D global climate model running online O3-NOx-CO-CH4-NMVOC-aerosol chemistry. We present here ensemble simulations from one such model (GISS ModelE2) driven by the future RCP scenarios from 2000-2100 designed to isolate and quantify the possible magnitude and sign of the feedback from lightning on surface temperature, ozone, and OH. We test the sensitivity of the feedback to different empirical parameterizations for lightning frequency commonly used by global models (cloud top height, convective precipitation, upward mass flux), and also explore new process-based lightning mechanisms (e.g., convective available potential energy, cloud microphysics).

P6.36 - CO-BENEFITS OF AIR QUALITY AND CLIMATE CHANGE POLICIES ON AIR QUALITY OF THE MEDITERRANEAN

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The Mediterranean basin is one of the regions of the world where significant impacts due to climate changes are predicted to occur in the future. Observations and model simulations are used to provide to the policymakers scientifically based estimates of the necessity to adjust national emission reductions needed to achieve air quality objectives in the context of a changing climate, which is not only driven by GHGs, but also by short lived climate pollutants, such as tropospheric ozone and aerosols. There is an increasing interest and need to design cost-benefit emission reduction strategies, which could improve both regional air quality and global climate change. In this study we used the WRF-CMAQ mesoscale air quality modelling system to quantify the contribution of anthropogenic emissions to ozone and particulate matter concentrations in Europe and the Eastern Mediterranean and to understand how this contribution could change in different future scenarios. We have investigated four different future scenarios for year 2050 defined during the European Project CIRCE:a “business as usual” scenario (BAU) where no or just actual measures are taken into account; an “air quality” scenario (BAP) which implements the National Emission Ceiling directive 2001/81/EC member states of the European Union (EU-27); a “climate change” scenario (CC) which implements global climate policies decoupled from air pollution policies; and an “integrated air quality and climate policy” scenario (CAP) which explores the co-benefit of global climate and EU-27 air pollution policies. In our simulations the BAP scenario largely decreases summer ozone concentrations over almost the entire continent, while the CC and CAP scenarios similarly determine lower decreases in summer ozone but extending all over the Mediterranean, the Middle East countries and Russia. Similar patterns are found for winter PM concentrations; BAP scenario improves pollution levels only in the Western EU countries, and the CAP scenario determines the largest PM reductions over the entire continent and the Mediterranean basin.

P6.37 - CHARACTERIZATION OF TOTAL OZONE COLUMN OVER FOUR ARGENTINEAN SITES USING DOBSON SPECTROPHOTOMETERS.

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Abstract. National Meteorological Service of Argentina monitors the ozone layer over the whole year through four Dobson Spectrophotometers placed in Observatories and research Stations who also are part of the GAW Programme. The sites are: Buenos Aires Central Observatory (OCBA) 34° 35' S, 58° 29' W, Comodoro Rivadavia Station (CRV) 45° 54' S, 67° 33' W, Ushuaia GAW Station (USH) 54° 51' S, 68° 18' W and Marambio Antarctic Station (MBI) 64° 14' S, 56° 38' W.

The aim of this paper is to analyze the time series (monthly averages) obtained from the ground-based measurement sites with the Dobson spectrophotometer in order to verify trends and some of the features of the ozone layer such as the inter-seasonal variation and periodicity in these latitudes.

Time series at the OCBA, CRV and MBI sites show negative trends -0.018 DU yr-1 for the period 1978-2012, -0.032 DU yr-1 over 1995-2012 and -0.003 DU yr-1 over 1988-2012, respectively, while USH shows a positive trend +0.007 DU yr-1 over 1994-2012, The TOC measurements at all sites show that long-term trends are small, being highly variable year to year.

In MBI no Dobson measurements are taken during the polar night (May, June and July). A high gradient is observed for the months of August, September, October and sometimes November due to the ozone hole dynamic, with an annual cycle and semi-annual cycle well established.

USH is mainly influenced by middle latitude air masses, but on certain occasions (austral spring) the polar vortex sweeps away the southern tip of the South American continent. On such occasions Ushuaia can be on the edge of or even inside the ozone hole, showing a high variability in the ozone values, often below the threshold of 220 DU but recovering quickly in a short period of time.

Finally OCBA and CRV sites are more stable, with a well-defined inter-seasonal cycle and very little variability, characteristics related to the ozone transport from the tropics to Antarctica.

P6.38 - A COORDINATED EFFORT FOR ATMOSPHERIC CHEMISTRY RESEARCH IN LATIN AMERICA

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In January 2013 under the IGAC framework, scientists from a significant number of Latin American and Caribbean countries attended a meeting in Bogotá, Colombia with the goal of sharing experiences, but also to join efforts to accelerate the development of atmospheric chemistry research in the region. The representatives of each country agreed to create an IGAC Americas Working Group (AWG) with an organizational structure that will allow this entity to continuously function into the future. A white paper has been produced describing the state-of-the-art atmospheric chemistry research in the region and also identifying common necessities and different strengths in the region. Given the large area that Latin America occupies (approximately 19,190,000 km2), its topographic and cultural diversity, the AWG aims to contribute to the different groups working on atmospheric chemistry by helping them share resource, both human and instrumental, helping to enhance collaborations within the groups that form AWG, seek possible sources of financial resources and also link scientific groups from other parts of the world with Latin American and Caribbean scientists, especially with groups that are at the first steps in building atmospheric sciences research in their countries. Advances made by several groups in the region have been identified and new challenges and gaps for studying atmospheric chemistry in this large region are discussed.

P6.39 - CO2 EMISSIONS FROM LAND USE AND LAND USE CHANGE IN RN: ADAPTATION OF INPE-EM MODEL

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This work presents an adaptation of the INPE - Emission Model for the vegetation in the Caatinga biome in the state of Rio Grande do Norte (RN), Brazil to estimate CO2 emissions from land use and land use change. Recently, impacts related to land use and land use change have drawn attention of the scientific community, in particular about the quantification of resulting carbon dioxide (CO2) emissions into the atmosphere. This fact is justified because CO2 is one of the most important atmospheric components related to the greenhouse gases (GHG) and its emission estimates shows large uncertainty. We created a database of deforestation rates and biomass for the INPE – Emission Model based on the literature information such as the Fundação de Ciência, Aplicações e Tecnologia Espaciais (FUNCATE) and the Ministério do Meio Ambiente (MMA). We combined annual maps of new clearings, maps of biomass and a set of alternative parameters based on the recent literature to adapt the model for the Caatinga biome of RN. Using this, we present the first estimate of CO2 emissions for the Caatinga biome of RN. With these estimates it is possible to better understand the regional impacts caused by land use change in the region, such as inappropriate land use and native vegetation deforestation. These results can be used for policy decision-making, to analyze the impacts of anthropogenic activities in the Caatinga biome and also will help improve regional emission inventories for atmospheric chemistry modeling.

P6.40 - GLOBAL TROPOSPHERIC OZONE FROM A GAW PERSPECTIVE

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The WMO Global Atmosphere Watch (GAW) program celebrates its 25thanniversary. GAW coordinates and undertakes high-quality long-term observations in six thematic areas. Reactive gases are one of these areas, and tropospheric ozone (formerly “surface ozone”) is one of the key parameters that are a focus of activities within this part of GAW. More than 800 stations measuring surfaceozone are registered as either “global”, “regional”, or “contributing” sites in the GAWSIS metadata system. Some data records in the World Data Center forGreenhouse Gases (WDCGG), which serves as the primary repository for reactive gases data, date back to the early 1970s, but most observational time series commenced during the 1990s, or after the year 2000 in Asia. GAW supports tropospheric ozone measurements through the development of standard operating procedures, a rigorous data quality control chain (including in some caseson-site audits), and through publicizing the data that are available in theWDCGG. The science advisory group on reactive gases (SAG RG) and the GAW secretariat oversee these activities and engage in scientific analysis of thedata. The data are however fully open to the community under a simple data protocol that asks for appropriate acknowledgement. Current efforts of the SAGRG aim at improving the documentation and linkage between tropospheric ozone data sets available from GAW and other scientific (e.g. IAGOS) or regional airpollution programs (e.g. EMEP, CASTNET, EANET) in order to facilitate an interoperable global dataset for scientific analyses and assessments.

This presentation gives an overview of the GAW reactive gases activities related totropospheric ozone, summarizes the state of global tropospheric ozone observations from the GAW perspective, and identifies the key challenges formaintaining and expanding the global observation network for reactive gases.

P6.41 - IMPROVING THE SPATIAL COVERAGE OF CONTINUOUS TRACE GAS OBSERVATION CAPACITIES WITHIN THE GLOBAL ATMOSPHERE WATCH PROGRAMME

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The provision of reliable scientific data and information on thechemical composition of the atmosphere is crucial for understanding atmosphericclimate change and for a sound assessment of the environmental players andimpacts. To get a complete picture of the whole globe, such data must belong-term, consistent, of adequate quality, and have to be availableworld-wide. The Global Atmosphere Watch (GAW) programme of the WorldMeteorological Organization (WMO) strives for achieving this goal bycoordinating and supporting the efforts of currently 29 global and more than400 regional atmospheric monitoring stations. Spatial data coverageconsiderably improved in recent years but data sparse regions still exist insome regions of the world despite the large number of GAW stations.

Among other recent international efforts, the project Capacity Buildingand Twinning for Climate Observing Systems (CATCOS) funded by the Swiss Agencyfor Development and Cooperation and coordinated by the Federal Office ofMeteorology and Climatology MeteoSwiss aims at establishing and resumingsystematic observations of greenhouse gas and other atmospheric and terrestrialEssential Climate Variables in developing and emerging countries where thedensity of observations is currently insufficient. Within CATCOS, Empa – as oneof the Swiss implementing partners – is in charge of establishing sustainableand high-quality greenhouse gas (carbon dioxide, methane, carbon monoxide andozone) measurement capabilities in Chile and Vietnam. In Chile, theimplementation took place at the regional GAW station El Tololo (30.17degS,70.80degW, 2220m asl) in the foothills of the Andes in April 2013 incollaboration with MeteoChile. The equipment in Vietnam was implemented incollaboration with the Vietnamese National Hydro-Meteorological Service (NHMS)at the Pha Din climate station (21.57degN,103.52degE, 1466m asl), a rural site in a hilly forested area in NorthernVietnam, in February 2014.

The presentation will give acomprehensive overview of the current global availability of ground-basedin-situ trace gas observations meeting the GAW requirements, the CATCOS projectand its goals in general, and the first results after 18 and 6 months ofcontinuous operation at El Tololo and Pha Din, respectively.

P6.42 - ATMOSPHERIC STATION KRESIN U PACOVA, CZECH REPUBLIC-A UNIQUE RESEARCH INFRASTURCTURE FOR STUDYING ATMOSPHERIC CHEMISTRY IN A CHANGING CLIMATE

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Climate, meteorology and atmospheric pollution are a linked system. Therefore, long-lasting research infrastructures covering all three areas are of highest importance in the current changing world. The Atmospheric Station (AS) Kresin u Pacova serves as a Czech

National Monitoring Point for the measurement of occurrence and long-range transport of greenhouse gases, selected atmospheric pollutants and basic meteorological characteristics. It consists mainly of a 250 m tall atmospheric tower equipped with meteorological sensors, gas analysers and a flask sampling system. Additional instruments are placed in a ground based container. The station is part of the European Atmospheric Station Network under the Integrated Carbon Observation System (ICOS) ensuring for long-term (20 years and more) monitoring of greenhouse gases in Europe. The AS provides also monitoring data to numerous other international and national databases (EMEP, GAW, InGOS, GMOS, ACTRIS, ISKO). The AS is located adjacent to the Kosetice Observatory specialized in air quality, meteorology and hydrology monitoring activities since 1988. Both infrastructures form the Co-located Station Kosetice – Kresin u Pacova.

The AS Kresin u Pacova started operation in 2013. First results offer insight into temporal dynamics and vertical concentration gradients of selected atmospheric pollutants: aerosols (measured at ground), total gaseous mercury (measured at ground and 240 m altitude) and tropospheric ozone (ground, 50, 125 and 230 m altitudes). These can be explained by the combined influence of local sources, long-range transport, boundary layer dynamics and atmospheric pollutant meteorology.

A study of air flow patterns conducted for the years 1988 – 2013 supports the characterization of the Kresin u Pacova locality in the sense of background sampling interpretation. The results are important for understanding long-range transport patterns relevant to the site and the possible development of air flow characteristics in future.

P6.43 - EFFECTS OF CLIMATE CHANGE ON OZONE AND NITRIC ACID DEPOSITION

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We investigate air quality changes in 2050 owing to global changes in climate and anthropogenic emissions of ozone precursors using a global chemical transport model driven by meteorological fields from a general circulation model. We use projected emissions based on the Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathways (RCP) scenarios and conduct model simulations to quantify the effects of climate changes and emission changes on future air quality focusing on ozone in the surface air. Our model results show that the global mean surface ozone concentrations will decrease in 2050 relative to 2000 by -0.7, -3.8, -7.2, and -7.9 ppbv under RCP 8.5, RCP 6.0, RCP 4.5, and RCP 2.6, respectively. The ozone reductions are primarily driven by NOx emission declines, which dominate over the climate penalty on ozone due to temperature increase. Our analysis of future model simulations with fixed ozone precursor emissions reveals that the climate penalties on ozone are 0.7 ppbv in the continents due to increases of biogenic isoprene emissions whereas -1.1 ppbv over the oceans due to increases of specific humidity under the RCP 8.5 scenario. This climate penalty in the warmer climate produces much higher nitric acid concentrations through enhanced nitrate evaporation and ozone chemical production, resulting in increase of acid deposition in the future.

P6.44 - CLIMATOLOGY AND SYNOPTIC VARIABILITY OF OZONO AT CERRO TOLOLO

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In this work we analyze the data collected at the regional Global Atmospheric Watch (GAW) station at Cerro Tololo (30S, 70W, 2000 m.a.s.l.). The station at Tololo has collected surface ozone and other variables since the mid 90's in a nearly continuous manner providing a unique 20 years data set in South America. In particular, we address the occurrence of sudden changes in ozone mixing ratios associated with deep troughs and cut-off-lows. This extends previous work considering a few years of data. Further we provide a trend analysis for this subtropical station.

P6.45 - SOURCE CONTRIBUTION ANALYSIS OF BLACK CARBON AEROSOLS IN SOUTH ASIA AND SURROUNDING REGIONS

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We implemented source,sector, and region specific black carbon (BC) aerosol tracers in the WRF-Chemmodel for the first time to assess the relative importance of different BCsources in South Asia during March-May 2006 when the Integrated Campaign forAerosols, Gases and Radiation Budget (ICARB) ship cruise in the Bay of Bengaland Arabian Sea took place. The model is found to reproduce the magnitude,variability and features of BC distribution observed during the ship cruisewith average observed and modeled BC mass concentrations along the ship-track of755±735 ng m-3 and 730±915 ng m-3 respectively. Averagemodeled BC mass concentration in South Asia is estimated as 1480±5920 ng m-3.Analysis of BC source tracers showed that anthropogenic emissions provide60-95% of the total BC mass concentration in South Asia except in Burma whereebiomass burning played a major role. BC emissions from residential (49%) andindustrial (37%) sectors are identified as the major anthropogenic sources inSouth Asia except in the Himalayas where transportation activities dominate.The anthropogenic sources located in all parts of India are found to contributeto BC loadings in the Bay of Bengal with the highest contribution from EastIndia. In contrast, the Arabian Sea is affected mostly by emissions from SouthIndia. These results have implications for the development of black carbonmitigation strategies in South Asia.

P6.46 - NEW UNCERTAINTY ANALYSIS OF THE CDIAC ESTIMATES OF FOSSIL FUEL CARBON DIOXIDE EMISSIONS

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Since the last IGAC meeting, a new uncertainty analysis of the CDIAC fossil fuel carbon dioxide (FFCO2) emission estimates has been completed and submitted for publication. This analysis included three different uncertainty assessments, each assessment examining the CDIAC data set from a different perspective. Each assessment has its own strengths and weaknesses and none fully evaluates the entire FFCO2 data set with all of

its components. This new approach grew out of the lack of independent measurements at the spatial and temporal scales of interest. Issues of dependent and independent data are considered as well as the temporal and spatial relationships of the data. The result is a multifaceted examination of the uncertainty associated with fossil fuel carbon dioxide emission estimates. The three assessments collectively give a range that spans 1.0 to 13% (2 sigma). Greatly simplifying the assessments gives a global fossil fuel carbon dioxide uncertainty value of 8.4 % (2 sigma). While the assessments focused on uncertainty in the global total emissions, one assessment also allowed attribution of the global uncertainty into component parts contributed by each individual country. Finally, to put perspective on the fossil fuel carbon dioxide emission uncertainty, it is compared to the uncertainty of other major components in the global carbon cycle.

P6.47 - RELEASE AND CHARACTERISATION OF NON-METHANE HYDROCARBONS FROM FRACTURED SHALE

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Shale (mudstone) is an abundant type of sedimentary rock comprising silt and clay-sized particles with significant quantities of organic matter (up to 8% by weight). Organic-rich shales have long been known as sources of oil and gas extracted from conventional reservoirs, but there has been renewed commercial interest in the past few years in shales as “unconventional” reservoirs for hydrocarbons, especially methane (“shale gas”). Hydraulic fracturing of shale (“fracking”) is the industrial process used to extract hydrocarbons from shale formations and is now being used or proposed in several countries. Besides methane, shale contains significant amounts of non-methane hydrocarbons (NMHC), but relatively little attention has been devoted to the study of the type of NMHC occurring in shales and to the mechanism of their release upon fracturing of the rock. We have made real-time observations of the release of NMHC from fractured shale samples taken from the Bowland-Hodder Formation (northwestern England). Our data indicate that a wide range of NMHC (mostly alkanes and aromatics) are released with temperature and humidity-dependent release rates, which depend on the physio-chemical characteristics of the different hydrocarbons classes and on the mode of storage within the shale. These results open the possibility of tailoring the “fracking” process to optimize the gas yields and to reduce the environmental impact. We discuss the implications of these findings for the environment and for the industrial and commercial exploitation of shales.

P6.48 - AEROSOL SIMULATIONS OF A NEW CHEMISTRY-CLIMATE MODEL (GRIMS-CHEM)

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We analyze the effect of aerosols on regional climate in East Asia using a new chemistry-climate model system (GRIMs-Chem), which is developed by coupling the Global/Regional Integrated Model system (GRIMs) with an offline aerosol module from the GE-

OS-Chem. This coupled model includes inorganic SO42--NH4+-NO3-, elemental carbon, organic carbon, sea salt, and soil dust aerosols whose concentrations are calculated at each model time step. The instantaneous aerosol concentrations are then used in the radiative transfer calculation in the model to account for the direct radiative forcing of aerosols. We conducted two 29-year model simulations from 1980 to 2008 with and without aerosols in the model to investigate the interactions of aerosols and regional climate in East Asia. We first evaluate the simulated aerosols by comparing with observations from the Acid Deposition Monitoring Network in East Asia. The comparison shows that the model successfully reproduces the observed seasonal variations of aerosol concentrations, which gives us some confidence in the model capability. We analyze the effect of aerosols on regional climate by comparing the two simulation results. The surface radiative forcing induced by the aerosol is about -15 to -20 W/m2 in China where the AOD is the highest, and -10 to -15 W/m2 in the downwind regions including the Korean peninsula. The model with the aerosols shows a warming in the atmosphere but a significant cooling at the surface relative to the model without the aerosols. This thermal redistribution causes the increase of atmospheric stability and the decrease of the annual mean precipitation about -0.2 to -0.3 mm/day over East Asia.

P6.49 - TWENTY YEARS TRACE GAS AND AEROSOL MONITORING AT GAW GLOBAL SITE HOHENPEISSENBERG

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Twenty years trace gas and aerosol monitoring at GAW Global SiteHohenpeissenberg StefanGilge, Christian Plass-Duelmer, Anja Werner, HaraldFlentje, Werner Thomas and Wolfgang Fricke

TheHohenpeissenberg Meteorological Observatory, oldest mountain observatory of theworld, has a long history in meteorological observations (over 230 years) and inozone measurements (since 1967). In 1994 the WMO Global Atmosphere Watch (GAW)global station Zugspitze/Hohenpeissenberg, platform Hohenpeissenberg wasestablished.

On thebasis of the recommendations given by the “Strategy for the Implementation ofthe Global Atmosphere Watch Programme” of WMO, measurements at Hohenpeissenbergstarted with about 10 parameters (e.g. O3, CO, particle numberconcentration, meteorological parameters ...). Since then the measurement program has developedto about 100 parameters relevant for atmospheric chemistry and physics.

The highquality measurement program at HPB and the provision of quality proved data tothe scientific community is accompanied by a scientific programme which focuseseon atmospheric chemistry and physics issues such as “gas to particle conversion”,“development of the stratospheric ozone layer”, “oxidation capacity oftroposphere”, “development of tropospheric ozone with regard to ozoneprecursors”, “remote sensing of atmospheric trace gases”, etc.. Results are published in peer reviewedjournals, GAW reports and GAW letters.

Thispresentation gives an overview of the activities of the Hohenpeissenberg site linkedto the GAW programme. A selection of time series of reactive trace gases andaerosols as well as scientific achievements will be shown.

P6.50 - HIGH-RESOLUTION GLOBAL SIMULATIONS OF ATMOSPHERIC COMPOSITION

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This poster will present recent results from high-resolution global simulations with the GEOS-5 general circulation model (GCM), including two different chemical mechanisms. The GEOS-5 GCM is a versatile model, used in a number of applications ranging from weather prediction through multi-decadal predictions of atmospheric ozone. The GEOS Chemistry Climate Model (GEOS CCM) includes a comprehensive troposphere-stratosphere chemical mechanism. Recent results have demonstrated the feasibility of running a cubed-sphere version of GEOS CCM with box edges of 28-km, corresponding to about one quarter of a degree in latitude-longitude space. This spatial resolution is able to represent many processes with great integrity, including the transport of stratospheric ozone to the surface in tropopause-folding events, thus allowing separation of natural surface air pollution events from localized pollutant emissions. The first example shown will examine the impacts of horizontal resolution on the representation of surface air pollution in the GEOS CCM. With simplified (linearized) chemical modules, the GCM can be run down to global resolutions of 7km. At these scales, the parameterized convective transport is scales back compared to lower resolutions, because the GCM's resolved dynamics begin to represent convective processes. The second example shown will examine the representation of "resolved" and "unresolved" processes as the global resolution of the model increases from values near 200km (typical of climate models) through 28km (typical of current global weather forecasts) down to 7km.

P6.51 - ROLES OF TRANSPORT AND CHEMISTRY PROCESSES IN GLOBAL OZONE CHANGE ON MULTI-DECADAL TIME SCALE

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Tropospheric ozone is the third most important greenhouse gas for the period from the pre-industrial era to the present. Both changes in tropospheric ozone precursor emissions and climate are expected to influence change in tropospheric ozone through transport and chemistry processes. This study investigates a change in tropospheric ozone between 2000 and 2100 along with the RCP6 scenario and individual impacts of transport and chemistry processes on the change. We conducted time-slice simulations for 2000 and 2100 and a sensitivity simulation forced by the 2100 transport field and the 2000 chemical field using a MIROC-ESM-CHEM climate—chemistry model and an O3-tracer transport model. The models predict a decrease in the global burden of tropospheric ozone (0.82%/decade) between 2000 and 2100. Tropospheric chemistry process reduces the global burden by 1.07%/decade. The reduction attributable to chemistry is caused by a combination of emission reductions and climate change. However, transport process causes an increase in the global burden (0.25%/decade). The increase attributable to transport process is contributed by ozone of both the stratospheric origin and the tropospheric origin. Enhanced stratosphere—troposphere exchange is responsible for the increase in ozone of the stratospheric origin in the whole troposphere. The increase in ozone of the tropospheric origin is confined in the free troposphere. The model

suggests that a reduction of ozone exchange between the planetary boundary layer and the free troposphere causes the increase in ozone of tropospheric origin in the free troposphere (i.e., ozone-rich air remains for longer time in the free troposphere where ozone chemical lifetime is longer than that in the planetary boundary layer). Additionally, we test the sensitivity of future change in ozone to increased horizontal resolution apart from any aspects of the sensitivity of chemistry to horizontal resolution. No marked difference is found in medium-resolution or high-resolution simulations, suggesting that the increased horizontal resolution of transport has a minor impact.

P6.52 - THE 2013 SMOKE SEASON: ELEVATED OZONE IN BOREAL FIRE PLUMES OBSERVED OVER CENTRAL EUROPE

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In July 2013 very strong boreal fire plumes were observed at the northern rim of the Alps by lidar and ceilometer measurements of aerosol, ozone and water vapour for about three weeks. In addition, some of the lower-tropospheric components of these layers were analyzed at the Global Atmosphere Watch laboratory at the Schneefernerhaus high-altitude research station (2650 m a.s.l., located a few hundred metres south-west of the Zugspitze summit). In particular, these observations showed significantly enhanced black carbon. The high amount of particles confirms our previous findings that fires in the arctic regions of North America have a much stronger impact on the central European atmosphere than the multitude of fires in the United States. This has been ascribed to the prevailing anticyclonic advection pattern during the favourable periods and subsidence, in contrast to warm-conveyor-belt export, rain out and dilution for lower latitudes. A high number of the pronounced aerosol structures were correlated with elevated ozone. Chemical ozone formation in boreal fire plumes is rather limited. However, these air masses could be attributed to stratospheric air intrusions over remote high latitude regions obviously picking up the aerosol on their way across Canada. These coherent air streams lead to rather straight and rapid transport to Europe.

P6.53 - USING METRICS TO QUANTIFY THE IMPACT OF AIR QUALITY POLICIES ON CLIMATE CHANGE

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Mitigation measures for shorter-lived pollutants that have a near-term climate forcing such as methane, black carbon and ozone have been proposed by organisations such as the Climate and Clean Air Coalition. To understand the effectiveness of this approach we need to quantify the climate effects of these pollutants and understand how they behave on different timescales. The global climate impact of short-lived species depends where they are emitted from, and the regional climate impacts even more so due to the heterogeneity of the forcing patterns. We might expect the benefits of mitigation measures (say of black carbon) to be greater than the global average over the region implementing the measures, but how much greater? We will show how regional climate metrics such as the ARTP (Absolute Regional Temperature-change Potential) can be used to relate continental gaseous and aerosol emission reductions to latitudinal changes in surface temperature. Once calculated these climate metrics can be used to estimate the temperature impacts of mitigation scenarios such as improved biomass cooking stoves, cleaner solid-fuel heating and filters on diesel vehicles, (generated under the UNEP Assessment on Tropospheric Ozone and Black Carbon). These metric-based calculations are then compared withe the results from running a full climate-chemistry model (HadGEM3). The science behind the effects of near-term climate forcers is relatively new and is advancing rapidly. The impacts of near-term climate forcers on precipitation patterns are even more complex than the impacts on temperature. Multi-model studies have been carried out as part of the ECLIPSE project to identify whether there are robust relationships that can be quantified.

P6.54 - IMPACTS OF CHANGES IN NORTH ATLANTIC ATMOSPHERIC CIRCULATION ON PARTICULATE MATTER AND HUMAN HEALTH IN EUROPE

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Ozone pollution and particulate matter (PM) represent a serious health and environmental problem. While ozone pollution is mostly produced by photochemistry in summer, PM is of main concern during winter. Both pollutants can be influenced not only by local scale processes but also by long range transport driven by the atmospheric circulation and stratospheric ozone intrusions. We analyze the role of large scale atmospheric circulation variability in the North Atlantic basin in determining surface ozone and PM concentrations over Europe. Here, we show, using ground station measurements and a coupled atmosphere-chemistry model simulation for the period 1980-2005, that with regard to ozone the North Atlantic Oscillation (NAO) does affect surface ozone concentrations - on a monthly timescale, over 10 ppbv in southwestern, central and northern Europe - during all seasons except fall. We find that the first Principal Component, computed from the time variation of the sea level pressure (SLP) field, detects the atmosphere circulation/ozone relationship not only in winter and spring but also during summer, when the atmospheric circulation weakens and regional photochemical processes peak. Given the NAO forecasting skill at intraseasonal time scale, the first Principal Component of the SLP field could be used as an indicator to identify areas more exposed to forthcoming ozone pollution events. Finally, our results suggest that the increasing baseline ozone in western and northern Europe during the 1990s could be related to the prevailing positive phase of the NAO in that period. With regard to PM, our study shows that in winter the NAO modulates surface PM concentrations accounting in average up to 30% of the total PM variability. During positive NAO phases, positive PM anomalies occur over southern Europe, and negative anomalies in central-northern Europe. A positive shift of the NAO mean states, hence, leads to an increase in cardiac and respiratory morbidity related to PM exposure in the Mediterranean countries with up to over 5000 more deaths per 20 million people for a 2000 emission inventory. In central-northern Europe, instead, higher wind speed and increased PM removal by precipitation lead to negative PM concentration anomalies with associated health benefits.

P6.55 - THREE-DIMENSIONAL VARIATIONS OF GREENHOUSE GASES OVER THE ASIA AND PACIFIC REGIONS MONITORED BY TWO JAPANESE REGULAR AIRCRAFT OBSERVATION PROGRAMS

Yukio Fukuyama;

A Japan-centeredobservation network by two Japanese aircraft programs have monitored thegreenhouse gases variations in the free-troposphere specifically over the Asiaand Pacific regions. One aircraft observation program is the ComprehensiveObservation Network for Trace gases by Airliner (CONTRAIL), in which in-situ CO2continuous measurement and flask air sampling are conducted onboard commercialairliner. The CO2 continuous measurement hasrevealed three-dimensional structure of the global CO2 distributionand has exposed significant inter-hemispheric transport of CO2 throughthe upper-troposphere over the Asia and western Pacific regions. Using theseCONTRAIL CO2 data, an inversion analysis has reduced flux errors significantlyin South and Southeast Asian regions. The flask air sampling measurement ofCONTRAIL has been conducted over 20 years and latitudinally observed greenhousegases variations over the western Pacific. The other aircraft observationprogram, which is operated by Japan Meteorological Agency following the GAW Program,has recently started and revealed seasonal variation of greenhouse gases variationsin the mid-troposphere over the western North Pacific by frequent flask air samplings.Above these aircraft measurement programs are regularly conducted formonitoring three-dimensional variations of the greenhouse gases, and they have asignificant role for filling the data gap of the surface measurement network. Combiningthese aircraft data could provide strong constraints on flux estimations ofgreenhouse gases fluxes for Asian regions, in addition to that provided by thesurface measurements.

P6.57 - IMPACT OF EUROPEAN AEROSOL EMISSION REDUCTIONS ON THE ARCTIC CLIMATE

Vidya Varma; Øyvind Seland; Annica M. L. Ekman; Trond Iversen; Alf Kirkevåg; Ilona Riipinen; Hamish Struthers; Hans-Christen Hansson;
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Anthropogenic aerosols are short-lived atmospheric constituents, which play a dualistic role in the earth system. They act as a forcing agent for the Earth's climate and are environmental pollutants with potentially adverse impacts on fresh water, soils, vegetation and human health. Due to the environmental pollution characteristics, emissions of anthropogenic aerosols and precursors have already been reduced in large parts of the world, including Europe. The changes in the magnitude and spatial patterns of global aerosol emissions have occurred especially during the last two decades of the 20th century and are projected to continue over the 21st century. Of particular relevance for the Arctic are the reductions in sulphate from industrial activities, domestic heating, and power production that have taken place in Europe since 1980.

In this study, the CMIP5-version of the NorwegianEarth System Model (NorESM1-M) is used to simulate the climate with different emission scenarios for aerosol and their precursors. The purpose is to study in detail how selected aerosols may have affected the radiative balance, the global climate in general, and the Arctic climate in particular. A three-member ensemble of reference transient simulations for the historical period 1850-2005,where greenhouse gas concentrations and aerosol emissions varied with time according to best estimates, are compared to various aerosol sensitivity experiments. In the experiments, global and European SO2 and BC emissions are kept at levels corresponding to the years 1850 and 1980, respectively. Analysis of a sensitivity experiment where the global SO2 emissions were kept constant at the 1850 level shows a steep increase in the annual-mean global surface temperature of ~0.6°C from 1976 to 2005whereas the experiment with global BC emissions kept at the 1850 level and the reference simulations show a smaller increase of up to ~0.4°C (currently not tested for significance). In addition, results from the analyses of simulations withEuropean SO2 and BC emissions fixed at 1980 levels will also be presented.

P6.58 - REDUCING UNCERTAINTY IN MODEL BUDGETS OF TROPOSPHERIC OZONE AND OH

Oliver Wild;
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Global model intercomparison studies addressing atmospheric composition change and its effects on air quality and climate have provided valuable scientific insight that has informed recent international assessment reports (e.g., IPCC, HTAP). However, such multi-model ensembles reveal that substantial diversity exists across current models in representation of the tropospheric ozone budget and methane lifetime, leading to large uncertainty in representing the interactions of atmospheric chemistry and climate. This diversity has reduced little over the past decade, despite advances in understanding. Previous studies have explored the sensitivity of these important budgets terms to emissions and to model representation of governing processes one at a time, but cannot account for the wide spread of responses seen across models. In this study we apply a novel, multi-variable perturbation approach to quantify the sensitivity of ozone and OH to key processes simultaneously, and use three independent global chemistry transport models to allow a much clearer characterization of the differences in model responses.We focus on the responses to important climate-relevant variables such as natural emissions, atmospheric humidity and cloud cover, and to poorly-characterized processes such as boundary layer mixing and deposition, as well as to changing surface emissions from anthropogenic sources. While all models show a clear sensitivity in ozone and methane lifetime to lightning NO emissions and to atmospheric humidity, the differences in magnitude of the responses allows us to identify and attribute differences in model behaviour to treatment of particular processes. The approach taken provides a rigorous assessment of the relative uncertainty due to different variables, allowing us to identify key areas where model improvements are required (e.g., lightning emissions) while providing valuable new insight into the importance of different processes driving tropospheric composition change.

P6.59 - CHEMICAL CLIMATE EVOLUTION ABOVE THE MEDITERRANEAN BASIN

Ricaud Philippe;
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The CHARMEX (Chemistry and Aerosol Mediterranean Experiment) Project is the atmospheric chemistry component of a large multidisciplinary Mediterranean regional programme is being carried out by French laboratories together with other international partners. It intends, among other things, to quantify processes explaining the temporal evolution of chemical compounds and aerosols in the troposphere above the Mediterranean Basin (MB). The Work Package "Variabilities, Recent and Future Trends" uses a large set of data (satellite, ground-based, sondes, aircraft, models and assimilation) to 1) estimate the variabilities and recent trends of several species (e.g. O3, CO, N2O, etc.) and aerosols, 2) evaluate the synoptic-scale circulation that control their transport, and 3) estimate the future chemical climate over the MB by 2100. The present study will focus on the analysis of the space-borne measurements from AIRS, IASI, GOSAT and TES and the model results from the CTM MOCAGE, the CCMs CNRM-AOCCM and LMDz-OR-INCA and from the models belonging to the ACCMIP project. We will concentrate on the time evolution of O3, CO, and CH4 from the surface to the upper troposphere above the Mediterranean Basin from 2000 to 2100 according to different emission scenarios. We will highlight the impact of the Asian Monsoon Anticyclone onto the mid-to-upper tropospheric fields of all the constituents from 2000 to 2100 in the Eastern MB in summer.

P6.60 - PREDICTION OF FUTURE OZONE AIR QUALITY IN SOUTHEAST ASIA USING THE NESTED REGIONAL CLIMATE MODEL WITH CHEMISTRY (NRCM-CHEM)

Teerachai Amnuaylojaroen; Mary C. Barth; Gabriele G Pfister; Jean-Francois Lamarque; Cindy Bruyere; Rajesh Kumar;
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SoutheastAsia is a region that can experience air pollution episodes, especially in Marchwhen biomass burning and anthropogenic emissions both contribute significantlyto the air quality in terms of gases and aerosol. This work aims to learn howozone mixing ratios will change between present day (2005-2009) and the future(2030-2034) time periods in Southeast Asia by using the Nested Regional ClimateModel coupled with Chemistry (NRCM-Chem) with 60 km and 12 km grid spacing forSoutheast Asian and Thailand domain, respectively. We focus on March and Decemberas they represent periods of high and low biomass-burning activity,respectively. The NRCM-Chem model employs initial and boundary conditions fromthe Community Climate System Version 3 (CCSM3) for meteorological variablesand Community Atmospheric Model with Chemistry (CAM-Chem) for chemical species.The emissions inventories include anthropogenic, biogenic, and biomass burningemissions. We conduct three simulations, 1) present day (2005-2009) climate andanthropogenic emissions, 2) 2030-2034 climate, using the A1B scenario, andpresent day anthropogenic emissions, and 3) 2030-2034 climate and anthropogenicemissions. The future anthropogenic emissions are the RCP4.5 scenario from CAM-Chememissions, while biomass burning emissions are the same in both present-day and2030-2034 simulations. The CO and NO2 from present day simulation agree fairlywell compare to observation in Thailand for both March and December.

Thesimulations with future climate only increase surface ozone by 7% - 26% inMarch and up to 50% in December. The future CO emission tend to increase surfaceozone over Indochina and Philippines by16 % and 96 %, respectively, while there is reduction

of the future NO emissionover Indochina by 32%. The simulation with future climate and anthropogenicemission leads to greater ozone increase as compared to the simulation withfuture climate and present day emissions, especially in Indonesia parts by 22%- 34%. In addition, the ozone prediction from the simulation with futureclimate and anthropogenic emissions is higher than CAM-Chem in March and issimilar in December.

P6.61 - HUMANS VS NATURE AS DRIVERS OF TROPOSPHERIC GASES AND AEROSOL CHANGES OVER THE LAST THREE DECADES

Nikolaos Daskalakis; Stelios Myriokefalitakis; Georgios Fanourgakis; Maria Kanakidou;
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Over the last century, the fast growth of Earth's population led to increased needs for food and energy. The development of our society has been thus accompanied by emissions of various pollutants into the atmosphere. This has affected the quality of the air as well as climate and the ecosystems. To face dramatic environmental changes, humans have taken measures to mitigate their negative impacts on the environment. The extent to which these measures have been successful is under investigation in the present modeling study. For this purpose a global chemistry and transport model (TM4-ECPL) is used to simulate atmospheric composition changes during the last 30 years (1980-2010) driven by ECMWF ERA interim meteorology and based on annual/monthly varying historical emissions of trace gases and aerosols. A second 30-yearsimulation has been performed assuming no change in the anthropogenic emission rates per human capita since 1980. Finally, the contribution of natural climate variability to the atmospheric composition changes is investigated by an additional 30-year simulation performed using the varying historical anthropogenic emissions while the meteorology and natural emissions are kept constant as of the year 1980. The results are presented, compared to long term observations of gases and aerosol, and thoroughly discussed.

P6.62 - LONG-TERM SURFACE OZONE VARIABILITY IN THE MEDITERRANEAN BASIN

Paolo Cristofanelli; José Antonio Adame Carnero; Martin Saliba; Francelle Azzoppardi; Ray Ellul; Francescopiero Calzolari; Rocco Duchi; Tony Cristian Landi; Davide Putero; Angela Marinoni; Paolo Bonasoni;
National Reserch Council of Italy;National Institute for Aerospace Technology;University of Malta;University of Malta;University of Malta;National Reserch Council of Italy;National Reserch Council of Italy;National Reserch Council of Italy;National Reserch Council of Italy;Institute of Atmospheric Sciences and Climate, National Research Council of Italy;Institute of Atmospheric Science and Climate;
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Tropospherícozone is an atmospheric key compound. It is recognised as a powerful greenhousegas, influences the oxidation capacity of the troposphere and affectspopulation health, ecosystem integrity and crop yields. O3 is ashort-lived climate forcer because it is an effective greenhouse gas. Levels oftropospheric O3 at regional scale are determined primarily by theemissions of pre-cursors strongly affected by natural and anthropogenic emissions.

TheMediterranean basin represents a hot-spot area in terms of short-term O3distribution and anthropogenic contributions to it. Surface O3 has doubledin the Mediterranean basin compared to pre-industrial ages due to thecombination of regional precursor emission growth and, possibly, inputs relatedwith intercontinental transport. Because of the typical anticyclonic, intensiveO3 photochemical production events frequently occur in this regionduring the warm period.

Whileseveral studies were performed for evaluating long-term surface O3variability and trends at remote and rural locations of continental Europe, toour knowledge no specific efforts were conducted to evaluate the long-term O3trends in the Mediterranean basin.

In thiswork, we present and analyse the long-term time series of surface O3 observationscarried out at three atmospheric observatories located in the Mediterraneanbasin: the "Mt. Cimone" World Meteorological Organization (WMO)/GlobalAtmosphere Watch (GAW) global station (44°12' N, 10°42' E, 2165 m a.s.l., Italy),the "Gozo" WMO/GAW regional station (36.07ºN, 14.22ºE, 160 m a.s.l., Malta) andthe El Arenosillo station (37.1 N, 6.7 W, 40 m a.s.l., Spain). Considering allthese measurement sites, an ozone record spanning the period 1991 – 2012 isavailable.

The studyaims at providing reliable indications about the lower troposphere O3 conditionsof the Mediterranean basin/southern Europe (MB/SE). In particular, we discussthe different daily and seasonal O3 behaviours affecting thesemeasurement sites as well as the existence of yearly and seasonal long-termtrends.

P6.63 - THE EFFECTS OF MID-LATITUDE STORMS ON TRACE GAS COMPOSITION USING THE MACC REANALYSIS DATASET

Katherine Emma Knowland; Dr Ruth Mary Doherty; Kevin Hodges;
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The influence of intense mid-latitude storm systems on spring-time ozone (O3) and carbon monoxide (CO) has been examined with a storm tracking algorithm over the Pacific and Atlantic Oceans in the Monitoring Atmospheric Chemistry and Climate (MACC) Reanalysis dataset for the period 2003-2012. Mid-latitude storms affect the distribution of CO and O3 from the background field by redistributing concentrations of CO and O3 horizontally and vertically throughout the storm. This occurs through three main mechanisms: (1) by vertically lifting values of CO and O3 from near the surface to the mid- to upper-troposphere in the region of the warm-conveyor belt (WCB). Ascent along the WCB also plays a role in the rising motion in the warm sector ahead of the cold front which transports elevated values from the mid-troposphere towards the tropopause; (2) in the descending air behind the storms (DI), where high values of O3 and low values of CO found in the stratosphere are brought down toward the mid-troposphere, and mid tropospheric values are brought toward the surface; and (3) in the cold-conveyor belt (CCB) low-level jet and upper-level jet where O3 is reduced and CO values are increased.

KEYNOTE TALKS

September 22 - Monday
8:00-8:30 **Paulo Artaxo**
The close links between the biological functioning of Amazonia and atmospheric chemistry

September 23 - Tuesday **GAW**
14:45-15:15 Global Atmospheric Watch - Celebrating 25 Years!
Gregory R. Carmichael

September 24 - Wednesday
8:00-8:30 **Jos Lelieveld**
Strongly growing air pollution and related mortality, especially in Asia

September 26 - Friday
8:00-8:30 **Akkihebbal Ramaiah Ravishankara**
Why do we do the (atmospheric) science we do?

INVITED TALKS

September 22 - Monday

8:30-8:50 **S1.1: Thomas Karl**
Probing the atmospheric oxidation capacity based on airborned eddt covariance measurements of volatile organic compounds

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10:20-10:40 **S1.2: Lucy Carpenter**
Progress in understanding the emissions, chemistry and impacts of reactive halogens

---

13:15-13:35 **S6.1: Jason West**
Connecting Climate Change, Air Pollution, and Human Health

September 23 - Tuesday

8:00-8:20 **S6.2: Paul Young**
Herding cats or herding sheep? A multi-model perspective on tropospheric ozone

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10:20-10:40 **S5.1: Carl Percival**
The role of Criegee Intermediates in Tropospheric Chemistry

13:15-13:35 **S5.2: Jason Douglas Surratt**
Heterogeneous Chemistry of Isoprene-Derived Epoxides Leading to Secondary Organic Aerosol Formation

September 24 - Wednesday

8:30-8:50 **S3.1: Ilan Koren**
Process level analysis of invigoration in warm convective clouds

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10:20-10:40 **S3.2: Akua Asu-Awuka**
The Chemical and Physical Evolution of Complex Cloud Condensation Nuclei

September 25 - Thursday

8:00-8:20 **S4.1: Tong Zhu**
Air pollution in China: Scientific and Public Policy Challenges

10:35-10:55 **S4.2: Michael Gauss**
Modelling different spatial scales

13:45-14:05 **S4.3: Paulo Hilário Nascimento Saldiva**
Combining greenhouse gases emission mitigation and health co-benefits due to reduction of local air pollutants: a global perspective

September 26 - Friday

8:30-8:50 **S2.1: AnneMarie Carlton**
Atmosphere-biosphere interactions during SOAS through multiphase chemistry

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10:35-10:55 **S2.2: Steven S. Brown**
Nocturnal biogenic VOC oxidation in the residual layer: Night flights in the Southeast U.S. during SENEX 2013

INTERNET ACCESS

Wireless internet access will be provided to the conference area. The username and password will be announced during the conference.

CONFERENCE BANQUET

On Thursday, 25 September, 2014, at 18:30 - 22:00

Location: Vila Hall - Vila do Mar Hotel

Via Costeira, 4233 - Parque das Dunas, Natal, RN

Transfers in: will leave from CCN at 17:30 and will stop at Ocean Palace Hotel and Sehrs hotel

Transfer out: will leave the Vila Hall to hotels Serhs, Ocean Palace, Natal Mar, Rifólis and Pontalmar at 22:20.

HALF DAYS EXCURSIONS

There are limited numbers of tour tickets available for some tours, please check the webpage for details:
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Tickets can be purchased at the registration desk.

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